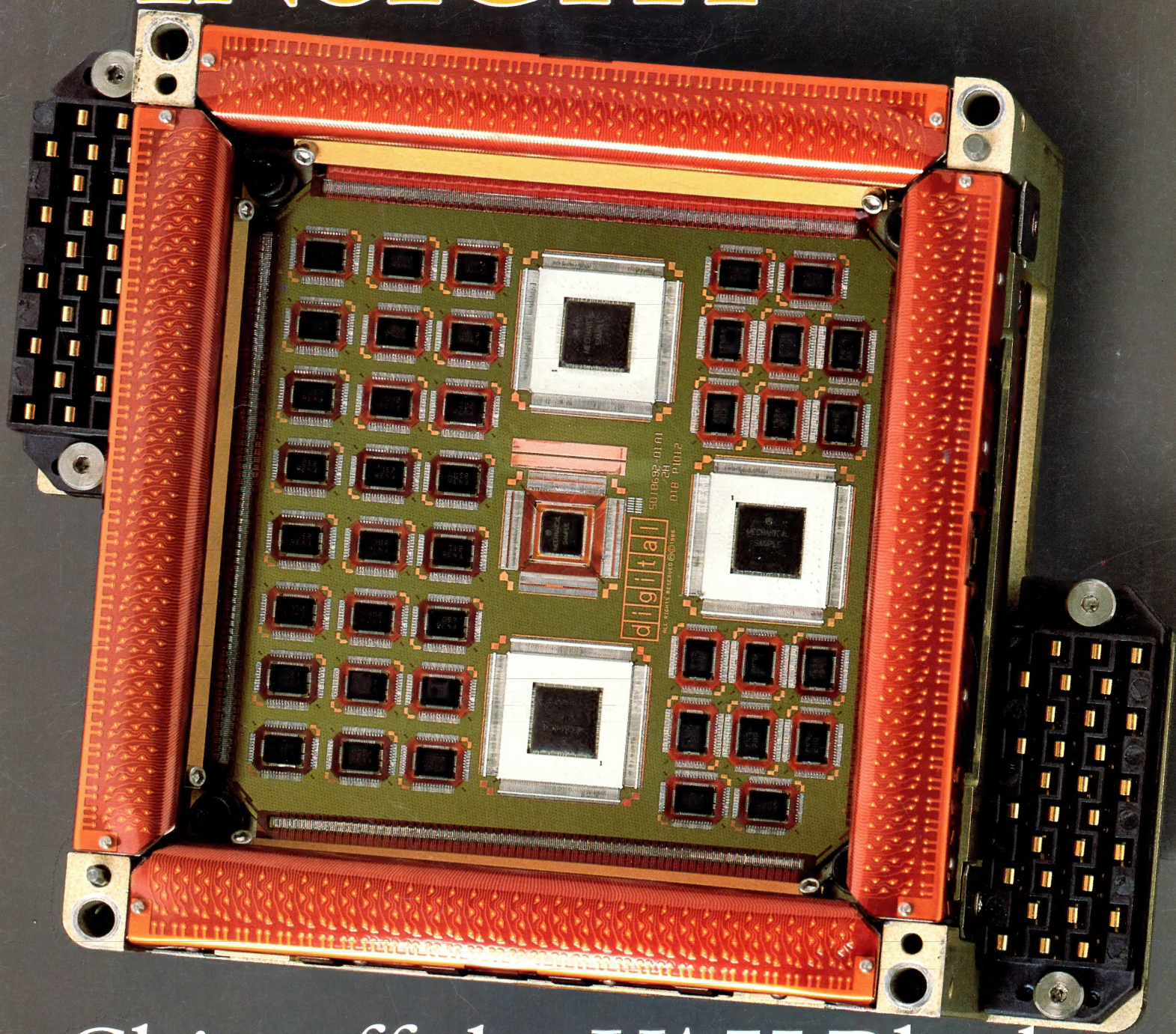
PRODUCT

INSIGHT

digital™



Chip off the VAX Block

MORE PERFORMANCE, SAME COMPATIBILITY

- LAN Bridge products
- ALL-IN-1 Phase II
- Workstation power

NOVEMBER 1989

PRODUCT INSIGHT

Digital Equipment Corporation
4 Results Way, MRO4-2/C8
Marlboro, Massachusetts 01752
Telephone: (508) 467-3481

Publisher
Daniel W. Hall

Editor
Anne Marie Brako

Staff Writers
Nancy F. Donchin
Gail Dyer
Stephen Frisselle
Andrew Hammond
Brian McWilliams

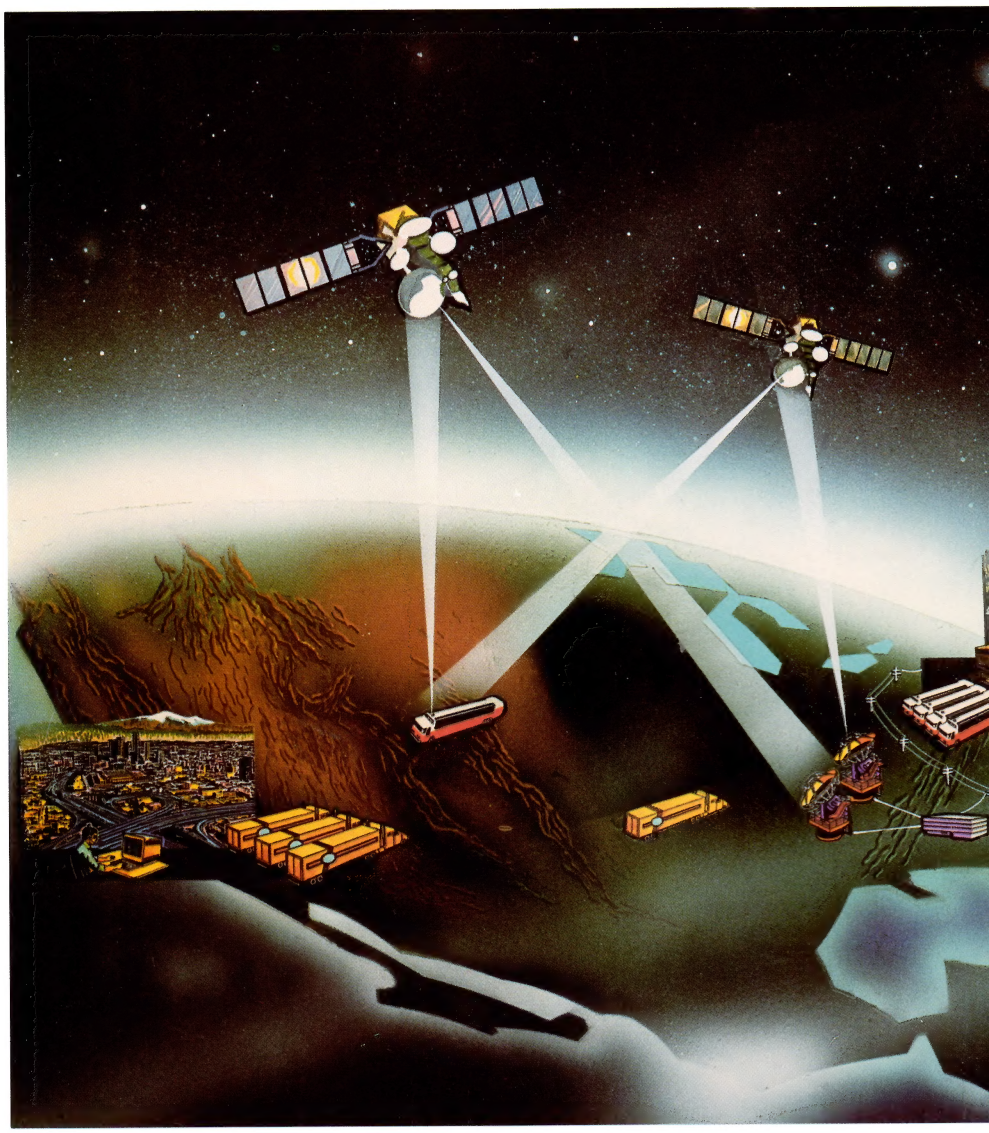
Contributing Writers
Christopher J. Coulson
Steven Salemi

Art Director
Irmgard H. Babineau

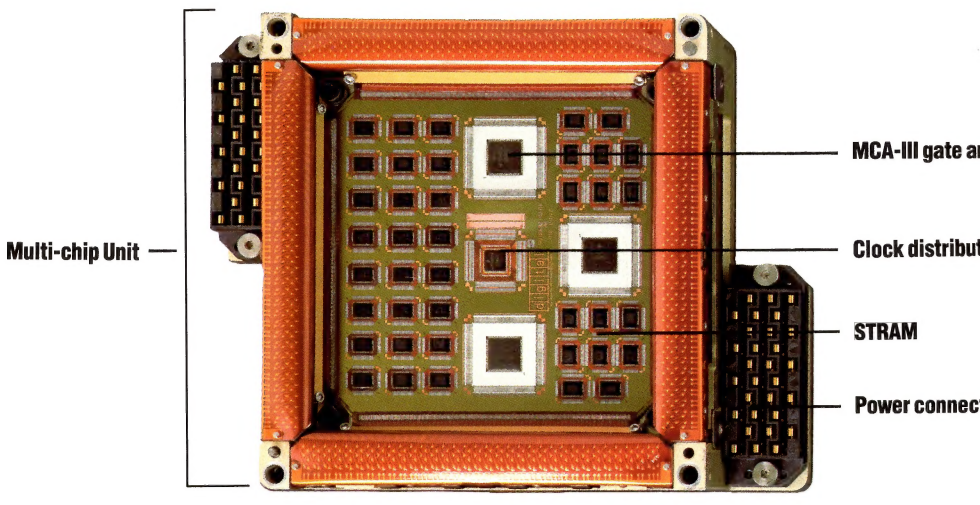
Photo Editor
Jean Osgood

Circulation Information
Diane Swenson

PRODUCT INSIGHT, published ten times a year, provides a comprehensive source of news about Digital's products and services. To subscribe, contact your Digital sales representative or fill out the mail-in form on the back cover.



Using satellite technology, Qualcomm's network management control center maintains communication between truckers and dispatchers. For the full story, see the article on page 16.



On the Cover:
The Multi-chip Unit (MCU) blasts the VAX computer into a higher level of processing. Three key components of the unit are the MCA-III gate array, the self-timed random access memory (STRAM) chip, and the clock distribution chip.

High-performance VAX Redefines the Mainframe

Vice President Robert M. Glorioso manages the development and marketing of Digital's high-end solutions, including VAX, VAXcluster, transaction processing, and high-availability systems. He sees the introduction of the VAX 9000 series as the beginning of a new era for mainframe computer users.

The word "mainframe" is one we at Digital have been reluctant to use. It seems to us that mainframe computers are traditionally characterized by high cost, unnecessary complexity, and a voracious appetite for physical and technical resources of all kinds.

Nevertheless, the term also implies a computing resource of great power and reliability, safely running the major applications that all businesses depend on. It is in this sense that we refer to VAX 9000 computers as mainframes. In every other regard, the VAX 9000 series continues the VAX systems tradition of configuration flexibility, availability, easy networking, and full compatibility.

To combine mainframe power with VAX system versatility while introducing new price/performance levels meant developing new technology. This proprietary technology will serve as the backbone for future high-end systems, and uses new interconnect techniques to increase processing speed and reliability. It shortens interconnect paths by increasing component density, and reducing the time it takes to move signals between chips.

High-speed processors and memory are not enough to fulfill Digital's vision of a mainframe computer. For most applications today, instruction rates are much less important than the number of transactions or floating point operations that can be completed in a given time. The VAX 9000 series excels in both these areas because it balances high-speed processing with a high-throughput I/O subsystem.

Reliability is a function of design as well as quality control.

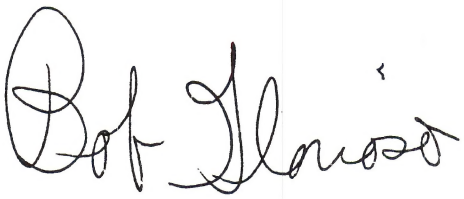
To this high-performing, well-balanced system, we add an intrinsic reliability. Reliability is a function of design as well as quality control. One-third of the logic in the VAX 9000 computer goes to functions such as fault identification, error correction, and error reporting. Battery backup and redundant power supplies all help to ensure the integrity of corporate data and maximize uptime for vital applications.

This combination of power and reliability means that VAX 9000 systems are ideal for tasks of all kinds. In a commercial environment they can perform high volume transaction processing; major, technical computations; and strategic applications, such as large-scale financial modeling.

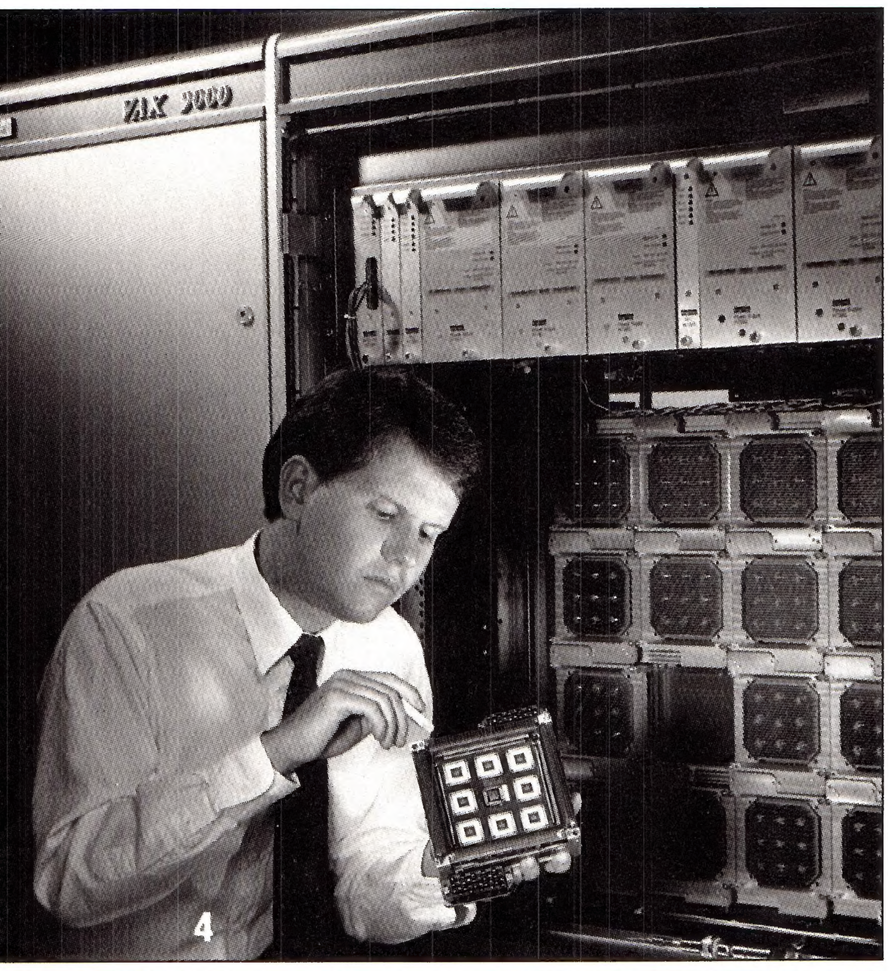
The rich VAX application environment ensures that users can find the programs they need. In a manufacturing environment the VAX 9000 delivers substantial compute power for MRP II and other applications. Scientific and engineering users can call on programs for tasks ranging from computational physics and chemistry, to seismic processing and mechanical CAD.

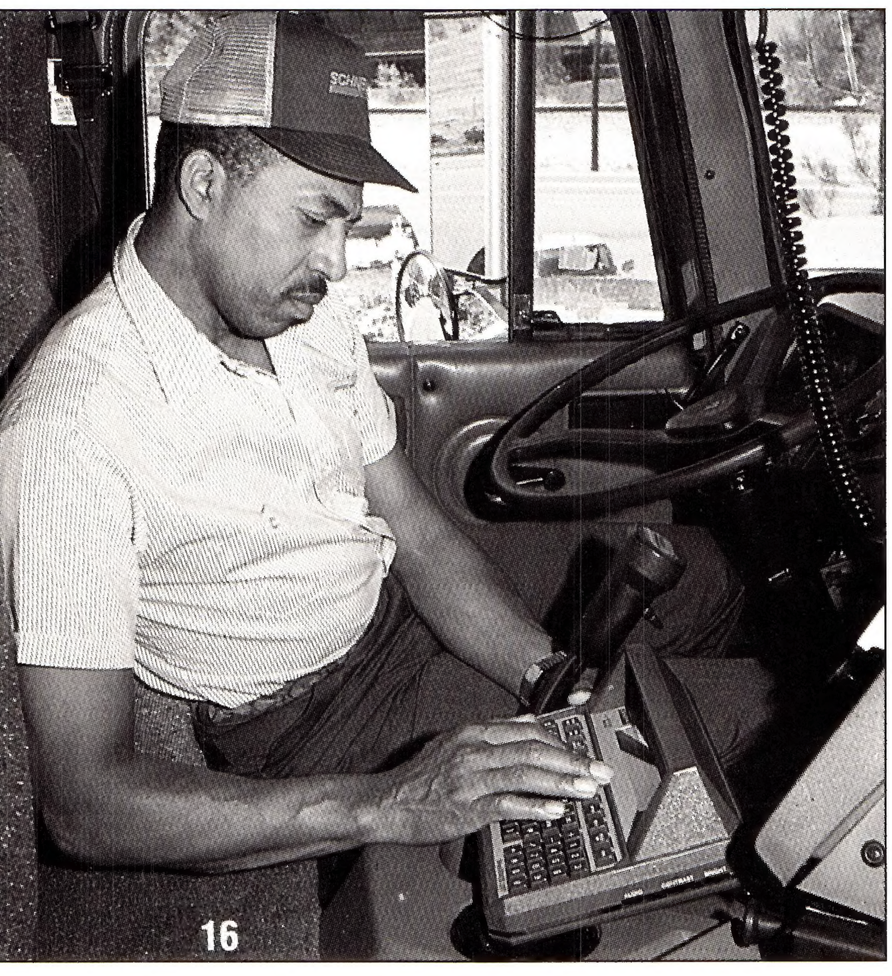
The VAX 9000 series demonstrates that we have listened hard to what computer users want today, and the way they want to develop in the future. We are delivering a resource that, in a VAXcluster configuration, can deliver up to 400 times the power of a VAX-11/780, yet which retains the versatility of every VAX system.

This is completely in line with our ongoing VAX strategy and makes us the only vendor to offer a wholly compatible range of computer systems covering every need from the desktop to the data center. Now, even your mainframes can be VAX systems.



Robert M. Glorioso
Vice President





CONTENTS

I/OPENER

1 **Mainframe metamorphosis:** Vice President Robert M. Glorioso describes how the VAX 9000 computer alters preconceptions about high-performance systems.

PRODUCT LINES

VAX News

4 **VAX 9000 series:** Mainframe-level machines take the performance and reliability of Digital computing to new heights.

5 **Raising the ante:** VAXcluster systems end up the big winners with 400 times the power of the VAX-11/780 system.

6 **VAX 6000 series:** Cost-effective vector option brings added flexibility to production computing.

7 **Summing up the vectors:** VAX 9000 computers can execute operations much faster than systems with only scalar processors.

8 **Transaction-processing account:** Australian water utility keeps tabs on customer activity with VAX Rdb/VMS and VAX ACMS software.

10 **Tracking technology:** Development of the Multi-chip Unit leads VAX computers into mainframe territory.

Using DECnet to its fullest: Network interconnect sustains high performance of VAX 9000 systems.

11 **Balancing throughput:** VAX 9000 architecture maximizes data access to a wide range of storage options.

12 **A new lease on computing:** How to sidestep budget constraints when selecting a VAX 9000 system.

13 **Building on the basics:** Sites select additional support options as needed.

Networking News

14 **Crossing the LANs:** Enterprise-wide networks can incorporate smaller networks without degrading performance or manageability.

16 **Turning networking vision into a reality:** Qualcomm, Inc., keeps communication lines open to its trucking fleet.

18 **Tying PCs together:** ThinWire Ethernet proves a reliable and cost-effective adhesive for joining personal computers.

19 **TCP/IP systems gain clout:** DECnet installations make room for UNIX computers with the INTERNET Portal.

Business Information News

20 **Modernizing the office:** ALL-IN-1 Phase II products take organizations into the '90s.

22 **No passport required:** Electronic mail moves freely across multivendor borders.

23 **Making the right decision:** Integrating information can help.

PRODUCT LINES

Desktop News

24 **Increasing workstation value:** VAXstation computers gain power, memory, and storage.

25 **A DECwindows view of MS-DOS:** A coprocessor enables Digital workstations to access MS-DOS applications.

26 **Leading storage product:** RZ56 disk drive lowers SCSI price-per-Mbyte ratio.

Q-bus adapter: VAXstation 3520 and 3540 gain communications and data storage options.

Cashing in on the Sun: Older workstations have a trade-in value of up to $4000.

27 **Printing on demand:** Flexible LA324 dot-matrix printer can meet the needs in executive offices or on the assembly line.

Protecting MicroVAX-based investments: Increasing performance by 450 percent is as simple as a board swap.

Realtime News

28 **Clocking realtime performance:** Systems tuned for immediate response—such as VAX and VAXstation computers—take on even more difficult tasks.

29 **Experimenting with the VAXlab software library:** A link to IEEE488 devices facilitates control.

NEWS ABOUT DIGITAL

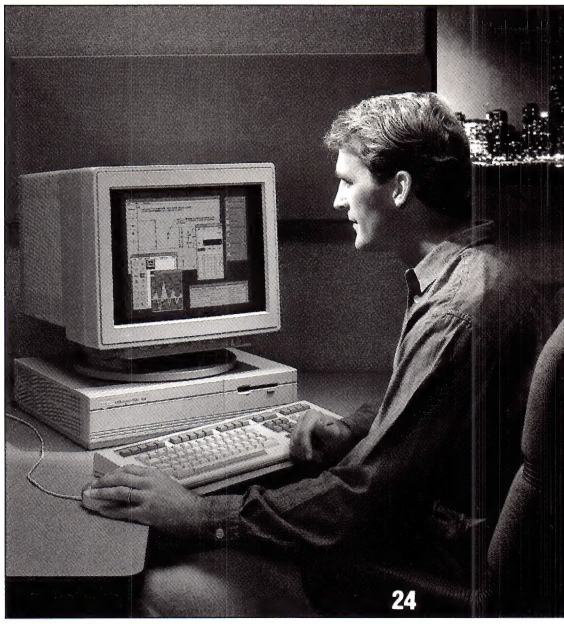
30 · Voyager 2 relies on Customer Services to keep transmission lines clear.
· Publications cite Digital as a good place to work.
· DECtp installations increase by 50 percent.
· Manufacturing award goes to storage group.
· Cambridge University purchases RISC-based products.

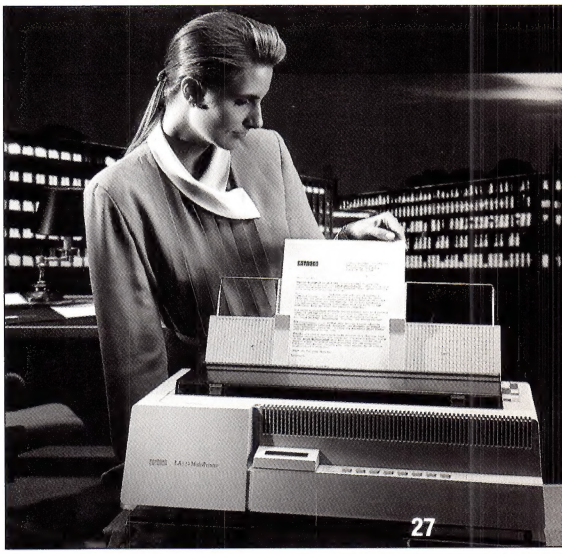
UPDATE

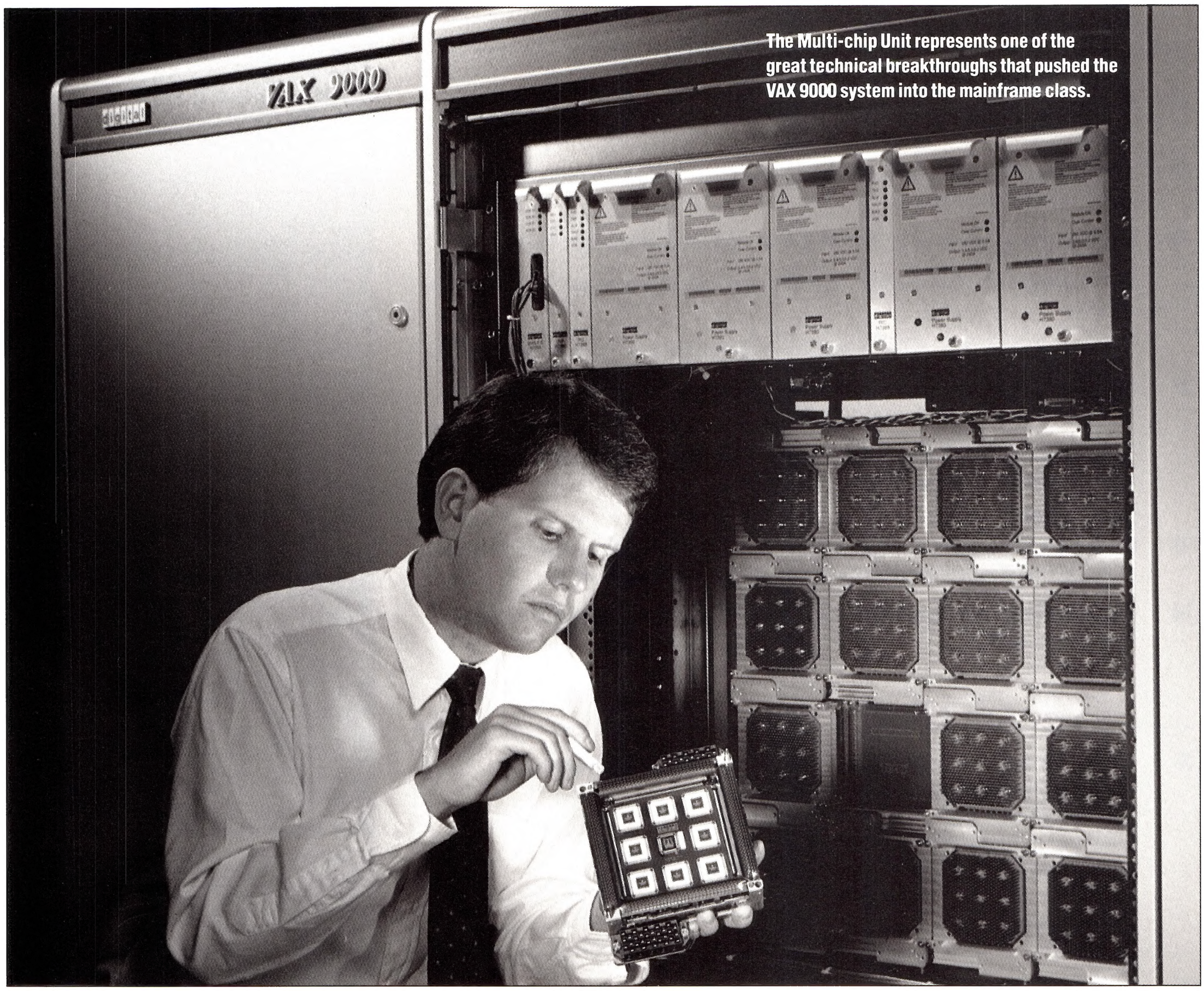
31 · KXJ11 peripheral processor
· DECwrite software
· PC service
· ULTRIX, DECwindows, and VAX Tools courses
· Campus guide

MARKETING AGREEMENTS

32 · Fisher Controls International
· Setpoint, Inc.
· StrataCom, Inc.
· DISC, Inc.
· Consilium Associates
· Environmental Systems Research Institute



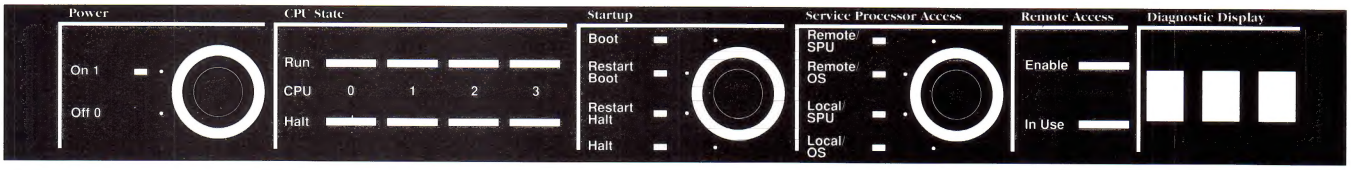




The Multi-chip Unit represents one of the great technical breakthroughs that pushed the VAX 9000 system into the mainframe class.

VAX 9000 Systems

DAZZLING PERFORMANCE AND RELIABILITY



All the benefits of Digital's style of computing – superior networking, distributed processing, architectural consistency, and VAXcluster technology – are now available for applications requiring advanced mainframe performance.

The VAX 9000 series delivers mainframe processing power and reliability along with the traditional VAX system benefits. It's ideal for high-performance technical and commercial applications, including high-volume transaction and vector processing. In short, the VAX 9000 performance competes with current offerings from mainframe vendors.

With multiprocessing and VAXcluster capabilities, the VAX 9000 systems can deliver more computing power in a shared environment than most systems from other vendors. Optional vector processing results in supercomputer performance. (See related story on page 7.)

High performance has many dimensions: support for heavy duty number crunching, high-volume transaction processing, large numbers of jobs or users, comprehensive databases, and sustained overall throughput. The VAX 9000 series balances all these areas to deliver overall high system performance.

With its VAX 9000 systems, Digital becomes the only vendor to offer a full line of compatible computers from the desktop to the data center. As the most powerful VAX system, the VAX 9000 system offers current VAX system owners the ability to grow their applications to the highest levels of mainframe computing without having to change system architectures, recompile source code, or retrain their staffs.

Balancing Act Maximizes Throughput

The high-throughput performance of the VAX 9000 series has been achieved by ensuring that all system components are balanced according to their relative speeds. This well-balanced system design complements the high-speed CPU, eliminating bottlenecks that might otherwise cause delays in the processing cycle. (See related article on page 11.)

At the heart of every VAX 9000 system, the system control unit acts as a traffic manager. It is a 2-Gbyte-per-second crossbar switch that provides the fastest processor, memory, and I/O interconnect in the VAX family. To provide the throughput to and from the system control unit, each CPU has a 1-Gbyte-per-second port with a 500-Mbyte-per-second input and output path. Four ports are available for CPUs – two for main memory and two for the I/O subsystem.

The VAX 9000 high performance uniprocessor is 30 times faster than the VAX-11/780 computer. The CPU achieves this speed in two ways – by maximizing cycles per second and by performing more work in a given cycle. The dense chip packaging delivers a 16-nanosecond clock speed. (See page 10 for more information on technological advances.) Pipelining is the primary technique used to maximize work done per cycle. Based on a six-stage approach that provides more internal parallelism during the instruction preprocessing stages, work is performed on six instructions simultaneously. As a result many of the instructions on the VAX 9000 system execute in one cycle.

The incorporation of 64-bit internal data paths, twice as wide as previous VAX systems, means the CPU performs double precision arithmetic at nearly the same speed as single precision tasks.

The VAX 9000 system has 128 Kbytes of two-way, associative, write-back cache memory included with each processor. Divided into data and instruction cache,

Continued on next page

Evaluating VAX 9000 Systems

VAX 9000 System	Number of CPUs	VUP[1] Performance	Maximum Vector Processors	Peak MFLOPS[2]	Number of XMIs	I/O Bandwidth (Mbytes)
Model 210	1	30	1	125	1	80
Model 410	1	30	1	125	2	160
Model 420	2	59	2	250	2	160
Model 430	3	88	3	375	4	320
Model 440	4	117	4	500	4	320

[1]VAX Units of Performance (1 = VAX-11/780)
[2]Millions of Floating Point Operations per Second

VAXcluster Magnifies Power

A VAXcluster configuration can increase VAX 9000 system performance up to 400 VUP of computing power, while offering balanced I/O throughput.

The following products, along with newly supported VAXcluster configurations, help you achieve this performance:

- The high-performance CIXCD computer interconnect (CI) – providing up to four times the I/O throughput of previous interfaces – connects the VAX 9000 system to a CI VAXcluster system.
- The CISCE expander combined with a CI star coupler supports up to 32 VAXcluster ports.

Together, these offerings provide the bandwidth, connectivity, storage capacity, and performance needed to integrate VAX 9000 processors smoothly into new or existing VAXcluster systems.

VAX 9000 Systems

continued from page 5

the memory segmentation boosts performance by allowing more efficient handling of programs and improving the hit rate of cache.

The large VAX 9000 main memory reduces paging and balances performance by enabling the caching of small databases and frequently referenced files. Up to 512 Mbytes of memory are available using 1-Mbit DRAMs (dynamic random access memory) on 64-Mbyte arrays.

Unlike other VAX systems, the VAX 9000 system employs one to four XMI buses solely for I/O to and from storage, networks, and VAXcluster systems. The XMI bus does not carry any interprocessor communications or processor to memory traffic, so the VAX 9000 system delivers sustained I/O throughput in a balanced manner.

Each XMI is capable of moving data at 80 Mbytes per second for a system total of up to 320 Mbytes per second. This high throughput is made available to different external systems by connecting to the XMI with these adapters: CIXCD for connection to CI VAXcluster systems; KDM70 for connection to disks, tapes, and other DSA storage devices; DEC LANcontroller 400 (DEMNA) for connection to Ethernet; and DWMBA for VAXBI devices.

Reliability Means Availability

Performance is important, but without availability, it means very little. Reliability is a system-wide attribute with the VAX 9000 series.

The density of the packaging reduces the number of required components and possible points of failure. The innovative air-cooled design keeps operating temperatures within limits.

The VAX 9000 series checks parity on all data paths. Error correction code on cache, memory, and all data paths makes it possible to identify, analyze, and often recover from errors before they cause a failure.

Protection against faults in the power supplies is accomplished through the utility port conditioner. This solid-state system has built-in redundancy and furnishes 100-millisecond ridethrough, harmonic filtering, power factor correction, and worldwide regulatory compliance. In the event of an extended power outage, battery backup keeps data in memory alive for 10 minutes.

A major contribution to system management and control is made by the service processor located inside the VAX 9000 system. The service processor watches the environment, measuring power levels, temperature, air flow, and the condition of the I/O buses and the utility port conditioner.

As Much Power As You Need

With the highest performing uniprocessor available from Digital, the VAX 9000 system is sold in two configurations that utilize the same processor. A vector processor can be integrated with each CPU to increase peak performance on numerically intensive tasks.

The VAX 9000 Model 210 is a bounded uniprocessor system with the best price/performance ratio of the series. The VAX 9000 Model 400 series is a fully expandable system that supports up to four CPUs and four I/O buses. Selecting the right configuration involves consideration of performance, growth, availability, system management, and cost requirements.

Upgrading from a uniprocessor to a multiprocessor configuration with a Model 400 is easily accomplished onsite. VAX multiprocessing systems run just one copy of the VMS operating system. Each CPU performs its own vector, cache, and memory management, with the system control unit tracking events and ensuring cache coherence for the overall system.

The VAX 9000 systems will run both the VMS and ULTRIX operating systems. With over 6,500 applications, mainframe throughput, and all the benefits of the VAX style of computing, the well-balanced VAX 9000 systems are truly the best choice for high-end computing tasks.

VAX 6000 Series Gains Vectors

With the lowest-priced vector processing option in the industry, the VAX 6000 system can develop, debug, analyze, or compile vectorized code quickly.

The VAX 6000 Model 410, Model 430, and Model 440 support a single vector processor, while the VAX 6000 Model 420 can accommodate two vector processors. The inclusion of vector emulation in VMS V5.3 enables developers to produce code on a VAX system without a vector processor.

Layered software products enhance the vector processing option. VAX FORTRAN V6.0 includes an auto-vectorization capability. The VAX Language Sensitive Editor (VAXLSE) handles error statements generated by the compiler. The VAX Performance and Coverage Analyzer (VAX PCA) enables users to optimize system performance.

Software compatibility among VAX systems provides configuration alternatives in a production environment. Developers can write and compile VMS code on a more affordable VAX system and then run the code on a higher-performance system.

VAX 6000 System	Number of CPUs	VUP[1] Performance	Maximum Vector Processors	MFLOPS (Double/single precision per processor)	Maximum VAXBI Channels	Maximum Band (Mbytes)
Model 410	1	7	1	45/90	6	60
Model 420	2	Up to 13	2	90/180	6	60
Model 430	3	Up to 19	1	45/90	6	60
Model 440	4	Up to 25	1	45/90	5	50

[1]VAX Units of Performance (1 = VAX-11/780) [2]Millions of Floating Point Operations per Second

Speed Up Your Number Crunching with Vector Processing

Any application that requires repetitive operations on numeric data – such as finite element analysis, fluid dynamics, and financial modeling – is a good candidate for vector processing. Rather than perform repeated operations serially in loops as scalar processors do, vector processors process an array of multiple data elements in a single operation – executing operations 10 to 20 times faster than a scalar computer.

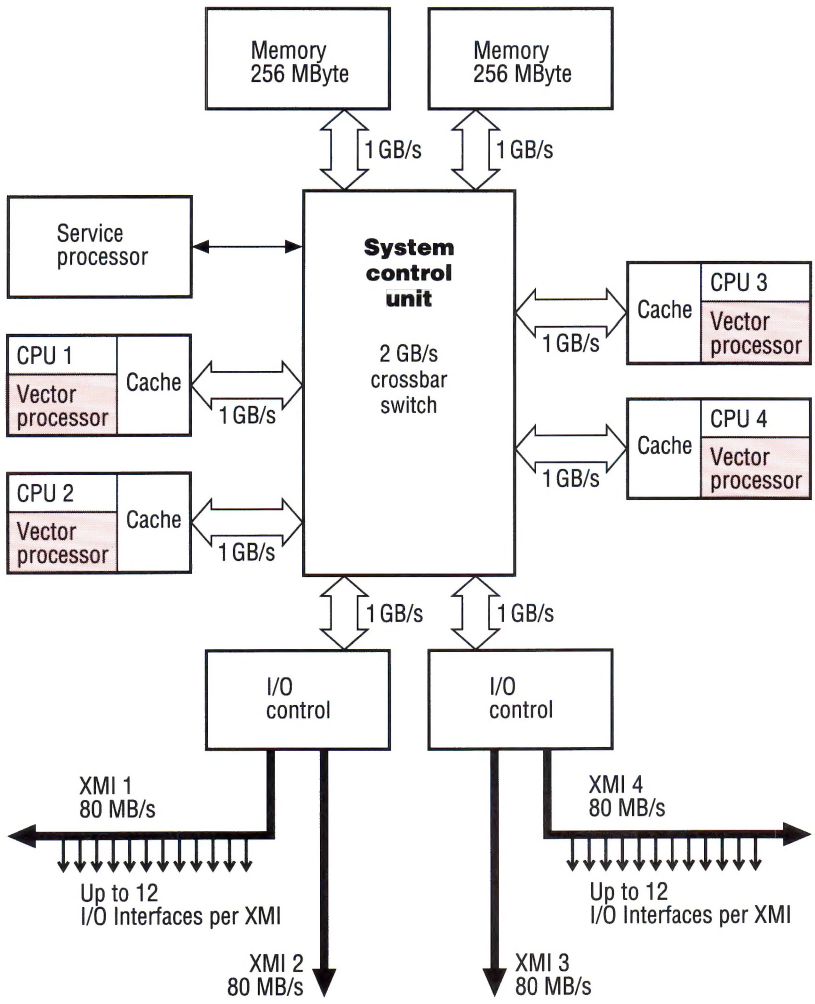
Digital's new vector processor option for the VAX 9000 and VAX 6000 series extends the VAX architecture to provide high-speed computation of numerically intense applications. Spanning 125 to 500 (VAX 9000 system) or 45 to 500 (VAX 6000 system) double-precision megaflops peak and 4 to 18 megaflops sustained, VAX vector processors offer the broadest spectrum of integrated vector processor performance in the industry.

Because all applications have unique portions of code that cannot be processed simultaneously, the performance of a vector application depends upon the performance of the scalar part of the application as well. The VAX vector architecture provides an integrated, balanced vector/scalar computing environment.

The scalar processor decodes the vector instructions and passes them to the vector coprocessor. For maximum performance, the VAX vector and scalar processors are asynchronous, with synchronization performed by the software.

VAX vector and scalar processors share the same memory and transfer control and status information over a dedicated high-speed internal path. Because the instructions used to program the vector processor are part of the host instruction set, no separate I/O instructions are necessary to transfer control information.

VAX 9000 System Architecture



Vector Programming Similar to Scalar

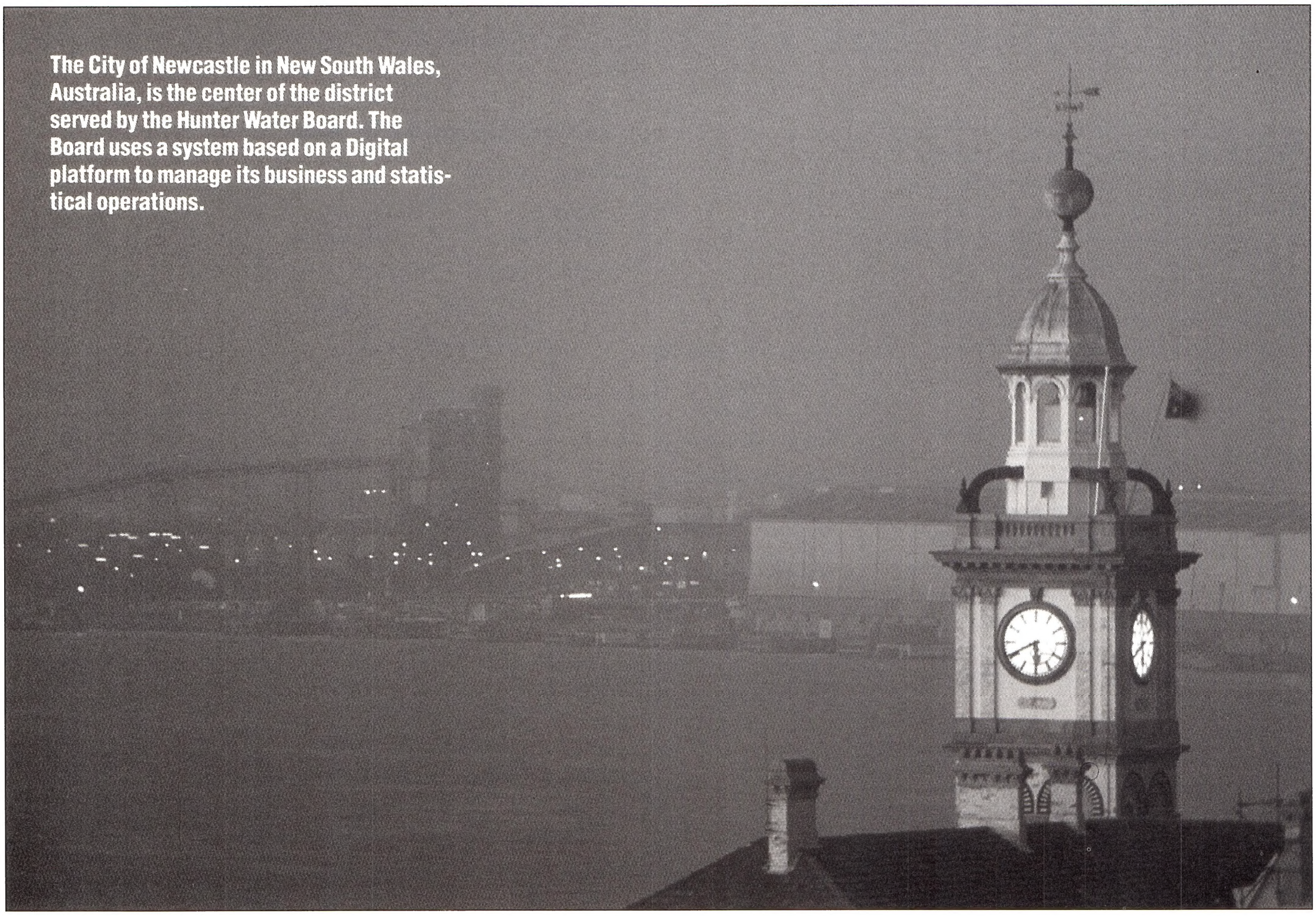
The VAX vector architecture is a register-based load/store architecture that supports 63 vector instructions. It provides 16 vector registers with 64 elements per register that can store double- or single-precision values. The major VAX data types are F floating (32 bits), D floating (64 bits), G floating (64 bits), and longword integer (32 bits).

Arithmetic and logical operations are identical to their scalar counterparts such as ADD, SUB, MUL, DIV, shifts, compares, and converts. Multiple vector instructions can execute in parallel and retire out of order.

There are two memory access/data storage methods: constant stride (the number of memory locations between consecutive elements in a vector) and random stride (hardware scatter/gather).

The VAX 9000 and VAX 6000 systems enhance vector processing performance through high performance features including pipelining and chaining results from one unit to another.

To ensure optimal vector processing performance, Digital supplies an integrated software development environment for creating new vector applications and converting existing applications for vector processing. Editing, compilation/assembly, linking, and execution follow the same command sequences used to develop applications for scalar VAX systems.


The City of Newcastle in New South Wales, Australia, is the center of the district served by the Hunter Water Board. The Board uses a system based on a Digital platform to manage its business and statistical operations.

Transaction Processing

WATER UTILITY SWIMS WITH SUCCESS

Safe drinking water is more precious than gold in drought-stricken areas, communities with chemically contaminated water supplies, and arid regions of the world. And nowhere is the concern about drinkable water greater than in Australia, a continent made up mostly of desert and surrounded by oceans.

To ensure a safe and sufficient water supply for its customers, one Australian water utility uses a computer system with a Digital platform to help it keep water consumption low and maintain modern water treatment and delivery facilities.

The system, called the Customer Services System, enables the Hunter Water Board to manage revenue figures and all water use and rate data for its 150,000 residential and 8,000 commercial users. The Board serves a 24-mile (40-kilometer) area around Newcastle in the state of New South Wales.

VAX Rdb/VMS Makes a Big Splash

The Hunter Water Board's Customer Services System features a network of 500 Digital terminals and personal computers located in six regional offices. Each user is connected by Telecom land lines to three VAX 8650 computers, one VAX 6320 system, a VAX 6330 machine, and two MicroVAX systems in the Board's head office in Newcastle.

The Board uses the Digital system to respond promptly to a steady stream of customer updates and inquiries. Two Digital products – VAX Rdb/VMS and VAX ACMS software – facilitate the answering process.

The VAX Rdb/VMS product is a relational database management system for general purpose, multiuser, centralized, or distributed applications that works with third- and fourth-generation languages. VAX ACMS software manages large numbers of concurrent transactions by providing additional servers to handle heavy network traffic. Transactions initiated by large numbers of terminals are channeled through a small set of server processes, which VAX ACMS increases when necessary.

Kin Liu, the Board's computer manager since 1986, recalls that VAX Rdb/VMS software was in its infancy when the system was developed. "It [VAX Rdb/VMS] was so new that not even Digital knew its power," Liu said. "Digital told us to expect Rdb to handle table sizes of 20,000 to 30,000 records, but our benchmark tests showed it handling half a million reasonably well."

Peter Michel, Hunter's deputy managing director, credited VAX Rdb/VMS software with playing a vital role in the success of the Board's computer strategy.

"Our Customer Services System and Human Resources Management packages are marketable," Michel explained. "Other government agencies and Digital are interested in them. They prove that Digital's VAX Rdb/VMS software is a valuable information management tool, not only for the Hunter Water Board, but for the entire water industry."

Hunter Takes the Plunge with Digital

In the early 1980s, the Hunter Water Board became the first water utility in Australia to replace a water and sewage rating system based on land value with a system that charges customers for the amount of water they actually use.

Excellent maintenance and distribution of its resources enables the Hunter Water Board to provide its customers with enough water to support the lush vegetation and natural waterways within its district.

The spinoffs of this change, which is scheduled for completion in 1992, have been enormous. Water consumption has dropped about 30 percent below the long-term trend, which has enabled the Board to defer the construction of costly new dams for at least 10 years. The delay in new construction has also made more money available for water system improvements, such as the further treatment of waste water before disposal and maintenance of aging pipes.

In 1983, the Board recognized that information systems were crucial to its success and engaged a consultant to evaluate its computing options. In 1984, the Board determined that its best option was a relational database system because the flexible Rdb technology gave it the capability to quickly change the detail and structure of data, add tables, and perform other important financial and data management tasks.

The Board considered various vendors but determined that Digital's products and services provided better integration for less time and money. Today, all internal development projects are managed with VAX Rdb/VMS software.

Systems Keep Information Afloat

Liu feels that Digital has given the Board the information systems security and integrity that it needs. "Most of the new systems we develop will use Digital's VAX Rdb/VMS software," he stated. "It's our preferred database facility."

In February, the Customer Services System and a stormwater investigation system also used by the Board won silver medals for excellence in information systems at Australia's Government Technology Event awards in Canberra. The second system provides Hunter with a visual presentation of the effects of stormwater runoff entering the waterways.

The Hunter Water Board and Digital have quenched the thirst for a clean and abundant water supply for a major portion of Australia. And this knowledge is worth more than money can buy.

VAX Engineering: Meeting the Mainframe Challenge

The developers of the VAX 9000 system faced a difficult assignment: to build the most powerful VAX computer ever with the highest availability.

To make the task even tougher, the system requirements called for the incorporation of a vector processing option, a new feature of Digital's VAX computers.

After researching alternatives, the developers decided they had to take an innovative approach. Only with the development of new technology could the group meet the requirements and produce a mainframe-class system cost-effectively.

Taking Apart the Chip Technology

The Multi-chip Unit (MCU) enables the VAX 9000 computer to process logic more quickly and with fewer chips than earlier VAX systems. The MCU, the basic building block of the VAX 9000 series, is incorporated in the CPU, the vector processor, and the system control unit.

The MCU's unique housing and interconnect technology make it possible to package very fast, very dense ECL circuits with the shortest interconnect paths. A cooling plate containing hundreds of thermally conductive pins provides air cooling.

The basic logic implemented in the MCA-III 10K Gate Array and ECL Self-Timed RAMs (STRAMs) boosts performance. The MCA-III gate arrays offer a 200-picosecond switch time with twice the speed and eight times the density of earlier ECL devices. The STRAMs operate at twice the speed of earlier cache memory. The cache "write back" memories provide faster recall for frequently used data.

Packaging Logic Thirty Times More Dense

Within the MCU, a unique polyamide-copper substrate called the High Density Signal Carrier (HDSC) connects the MCA-III and STRAM chips. Similar in concept to a printed circuit board (PCB), but created using sophisticated semiconductor fabrication techniques, the HDSC allows logic devices to be packaged closer than ever before.

The HDSC is a wafer composed of eight signal and power layers, providing a packaged medium 30 times denser than that of today's printed circuit boards. The simplified connection increases speed and reliability.

The modular design, the system building block, and leading-edge packaging permit the easy addition of the vector option. They also result in simplified maintenance.

Employee at Digital's advanced development center in Cupertino, California facility displays two MCUs after assembly.

In the VAX 9000 systems Digital turns the performance, reliability and affordability of MCU technology into an exceptional mainframe.

Controller Sustains VAX 9000 Performance over Ethernet

Digital's new network interconnect, the DEC LANcontroller 400 (DEMNA), provides the level of performance necessary to distribute the benefits of VAX 9000 systems in a networked environment.

A high-performance XMI-to-Ethernet controller, the DEMNA delivers ten times the performance of earlier interfaces and makes it possible for DECnet implementations to sustain traffic rates of 10 Mbits per second over Ethernet networks.

The DEMNA uses its 512 Kbits of buffered memory for storing commands and data packets, while providing network services. It also gives facilities the option of enabling users to monitor network operation and utilization, and to simplify application debugging.

Two Heads Are Better than One

Using more than one DEMNA controller, VAX 9000 systems can handle significantly greater network traffic than other VAX systems and distribute the traffic more evenly.

For example, one DEMNA controller can accommodate terminals on a DECserver (LAT) system, while a second DEMNA processes network protocols such as DECnet. At the same time, a third controller might handle VAXcluster traffic in a mixed interconnect cluster.

Each VAX 9000 system comes equipped with one DEMNA. Users seeking to maximize their level of network service can add further controllers depending on their configuration and application mix. Typically, each Ethernet segment will use its own DEMNA, with other controllers added to support printers and print servers.

I/O Subsystem Maximizes VAX 9000 Throughput

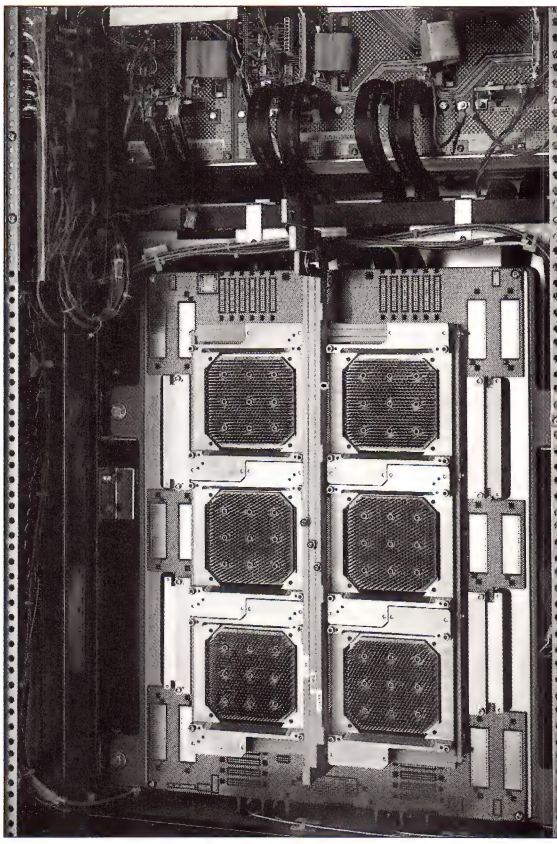
Balance between processors and an I/O subsystem is essential to the top performance of a computer system. For number crunching, large production runs with execution-time constraints, or high-volume transaction processing, a computer system requires high-speed processors, mainframe-class throughput, and high-capacity data storage. That's why the VAX 9000 I/O subsystem is engineered with the performance, capacity, and reliability to match the system's advanced CPU technology.

Storage unlocks the full power of the VAX 9000 systems with four-way crossbar switching and memory interleaving, an I/O bandwidth of up to 320 Mbytes per second, up to 1 Gbyte of memory bandwidth per second, local disk support for over 200 Gbytes of data, and VAXcluster shared disk storage of more than one trillion bytes (1 Tbyte).

By configuring your VAX 9000 system with the storage and information management products required by your applications, you can ensure the right balance between CPU, memory, and I/O – balance that is the key to maximum performance – and meet the need for high availability and access.

Like VAX CPU technology, Digital storage and information management technology has advanced dramatically in recent years. This technology is now available in a range of high-performance storage and information management products for the VAX 9000 systems. These products include the following:

- MS900-BA 256-Mbyte Memory Option. The memory option increases the VAX 9000 system memory capacity to 512 Mbytes using 1-Mbit DRAMs. The VAX 9000 Model 440 comes configured with 512 Mbytes standard. This memory option enables all VAX 9000 systems to perform four-way memory interleaving. This greatly reduces memory latency – the time from command receipt to transfer to the system control unit – and increases sustained transfer rates. Systems without this add-on memory option support two-way interleaving only.
- ESE20 Electronic Storage Element. The electronic storage element provides the highest I/O performance of Digital's storage devices with an access time of approximately 1.6 milliseconds. Such fast data access enables the ESE20 to service over 300 single-stream I/O requests per second, offering up to 10 times the performance of magnetic disks.
- KDM70 Disk and Tape Controller. The disk and tape controller services up to 700 I/O requests per second and offers a sustained data transfer rate of 3.4 Mbytes per second. It also provides performance optimizations such as fully overlapped seeks, rotational optimization, seek reordering, and request fragmentation.
- HSC40 and HSC70 VAXcluster Storage Controllers. These controllers provide shared access to disk and tape resources, servicing up to 1,150 I/O requests per second while offering performance optimizations such as fully overlapped seeks, rotational optimization, seek reordering, and request fragmentation.
- SA650, SA600, and SA705 Storage Arrays. These storage arrays support up to 220 Gbytes of disk storage using the RA70 and RA90 disk drives, Digital's fastest, most reliable drives. The SA705 array also offers the convenience and security of removable data.
- VAX Disk Striping Software. The software speeds up access to large files by spreading them across disks that appear as one large disk to the VMS operating system. Transfer rates approaching 80 Mbytes per second and dynamic load balancing across spindles are also provided.
- TA90 Cartridge Tape Subsystem. This tape device features the industry-standard IBM* 3480-compatible cartridge tape format, providing high-speed, unattended backup or journaling, and media interchange with IBM systems.
- RV64 Optical Jukebox. The optical jukebox provides 128 Gbytes of write-once/read-many (WORM) optical storage and automated media handling.
- VAX Rdb/VMS Data Management Software. This software helps integrate the enterprise at the information level by supporting complex production applications (TP), end user information management, and application development.



Four I/O channels connect to the system control unit (SCU) depicted here of the VAX 9000 system. The separation of data storage activity from the rest of the system traffic enables the SCU to move expanding memory bandwidth.

*IBM is a registered trademark of International Business Machines Corporation.

Why Not Consider Leasing?

Digital Equipment Corporation
Customer Finance

If the VAX 9000 system seems inviting but unattainable because of budget constraints, leasing could be the solution.

In addition to the standard lease offerings, Digital has a special VAX 9000 lease program offering extremely attractive pricing on both the Model 210 and 400 series. The operating lease is available in two popular terms, 36 or 48 months.

The lease program requires no down payment, and Digital can tailor a payment plan to meet your needs.

After a thorough review of your leasing requirements and specific system configuration, Digital will provide a lease quotation. The lease program requires no down payment, and Digital can tailor a payment plan to meet your needs. In many cases, you can write off the lease payments under FASB 13 guidelines.

At any time after the midpoint of the lease term, you have the option of upgrading a leased VAX 9000 system through a board swap or CPU exchange. System add-ons, such as peripherals, can be accommodated into the lease at any time.

Digital can consolidate the cost of software, required services, training, and other system-related expenses into the lease contract, minimizing budget administration issues. At the end of the lease term, three convenient options are available. You may return or purchase the system at the fair market value, or simply renew the lease.

DECLease™
Commercial

DECLease™ is a financial service of Digital Equipment Corporation.

LEASE NUMBER

LESSEE (Complete Street Address and Zip Code)

(1) a. ABC WORLDWIDE MFG. CO.
2468 WINDSOR ST.
ANYTOWN, U.S.A.

b. Billing address
ANYTOWN, U.S.A.

LESSOR
DIGITAL EQUIPMENT CORPORATION
100 NAGOG PARK
ACTON, MA 01720-3499

(2) QUANTITY	EQUIPMENT AND/OR SOFTWARE DESCRIPTION (Model Number, Description [list serial numbers if available])	
1	VAX9000	MODEL 410
1	MS900	256MB
1	CIXCD	XMICI INTERFACE
1	KV900	VECTOR PROCESSOR
2	RA90	DISK DRIVE
1	TA81	TAPE DRIVE
1	HSC70	CONTROLLER

(3) LOCATION OF EQUIPMENT: ANYTOWN, U.S.A.

(4) INSURANCE CARRIER: XYZ INS. CO.
INSURANCE AGENT: XYZ INS. AGENCY
AGENT'S ADDRESS: 8910 VAX AVE.
AGENT'S PHONE: 1-555-5678

TERMS OF LEASE PAYMENT

(5) Initial Term	(6) Lease Payments	(7) Advance Lease Payment(s)	(8) Renewal Lease Payments	(9) Purchase Option/Riders
36 Months	☒ Monthly ☐ Other _____ Amount $_____	$_____ Representing payment for the first _____ Month(s) and the last _____ Month(s) payable on the signing hereof.	_____ Months/ Years $_____ Payable each Month/ Year in advance.	☐ $1.00 (One Dollar) Purchase Option ☐ ___% Purchase Option ☐ Fair Market Value Purchase Option Rider #'s:_____

TERMS AND CONDITIONS OF LEASE

1. LEASE: Lessor hereby leases and licenses to Lessee, subject to the terms of this lease and the terms and conditions of any Addendum and/or Riders attached hereto (the "Lease"), the equipment and/or software listed above and in any Schedule A annexed hereto (hereinafter, such property, together with all replacement parts, repairs, additions and accessories incorporated therein and/or affixed thereto, all referred to herein as the "Equipment and/or Software").

Except to the extent modified herein, the parties hereto by their execution and delivery of this Lease, reaffirm and incorporate herein by reference Lessor's United States Standard Terms and Conditions (the "Standard Terms") a copy of which is attached hereto as Exhibit A and made a part hereof as if such Standard Terms were fully set forth in this Lease.

Notwithstanding the above, should any of the terms and conditions of a Digital Business Agreement ("DBA") currently in effect between Lessor and Lessee be in conflict with the Standard Terms, then the terms of said DBA shall prevail. However, the parties expressly agree that should either the Standard Terms or the terms and conditions of any applicable DBA be in conflict with the terms and conditions of this Lease, the latter shall prevail.

THIS IS A FOLD OUT LEASE DOCUMENT. THE ADDITIONAL PROVISIONS CONTAINED ON THE REVERSE SIDE HEREOF AND ON THE FOLD OUT PORTIONS ARE INCLUDED IN AND MADE A PART OF THIS LEASE WHICH LESSEE ACKNOWLEDGES HE HAS READ. THIS IS A NON-CANCELLABLE LEASE FOR THE TERM INDICATED ABOVE.

LESSEE: ABC Worldwide Mfg. Co. (Legal Name) ACCEPTED AND EFFECTIVE this 28 day of Nov. 19 89

DBA

By Samuel Adams V.P. (Authorized Signature / Title / Date)

DIGITAL EQUIPMENT CORPORATION (Lessor)

By S. J. Logan (Authorized Signature)

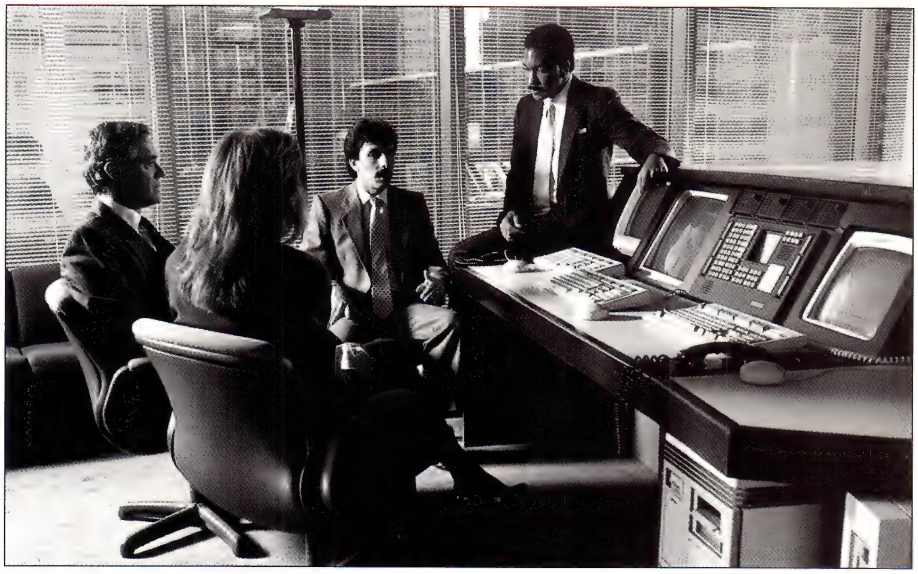
ORIGINAL

Tailored Support Services Suit VAX 9000 Customers

As computer systems grow larger and more complex, the need for comprehensive, quality system support becomes greater. With the introduction of the VAX 9000 systems, Digital provides an unprecedented level of support to its high-end system owners – customized support services to meet their needs.

Digital's support services for VAX 9000 systems include training, systems engineering, performance management, and hardware and software installation services.

Through these services, Digital matches computing power to the customer's requirements, addresses system integration considerations, and ensures successful installation and operation of the VAX 9000 system.



Under Digital's standard warranty for VAX 9000 systems, customers receive one-year of unlimited training for 20 designated persons in Digital seminars and lecture/lab courses.

Product Warranty Fits Perfectly

Digital offers a one-year standard product warranty for both the VAX 9000 Model 210 and Model 400 systems. This warranty features a support implementation plan (SIP) jointly developed by Digital and the customer that defines the appropriate mix of services to be delivered during the warranty period and ensures that the customer receives all appropriate training, systems consulting, and performance management services.

One key feature of the SIP is the inclusion of Digital's Unlimited Training Subscription (UTS) program. UTS provides VAX 9000 users with training plan services, unlimited attendance for 20 designated participants at regularly scheduled Digital seminars and lecture/lab courses held during the warranty term, and unlimited access to an eight-course self-paced instruction library after the one-year warranty expires.

Other warranty services are hardware and software installation; one year of on-site hardware remedial service with a two-hour committed response time 24 hours a day, seven days a week; and the 24-hour, seven-day-per-week DECsystem telephone support service. There is also, on-site critical software support; access to a support database; and the right to use new software versions, which defrays the cost of licenses for new software versions.

Owners of VAX 9000 systems may purchase up to two one-year extensions to the standard product warranty at the time of the sale. Leasing customers receive warranty support services for the term of their leasing plan.

Sew Up Success with Automatic Services

Digital develops a configuration control document (CCD) and offers advanced electronic support (AES) for each purchase of a VAX 9000 system. These services are provided automatically and are separate from the standard product warranty.

The CCD ensures consistency in the sale, delivery, and installation of VAX 9000 systems. A comprehensive plan that covers environmental issues, site requirements, floor plans, cable layouts, software considerations, and installation needs at the customer's site, the CCD ensures the technical integrity of the VAX 9000 system and helps achieve a smooth transition of the machine into an existing installation.

Finally, AES provides owners of VAX 9000 systems with increased system availability, greater application integrity, improved productivity, and simplified system and service management. AES gives VAX 9000 users access to Digital's predictive service technologies and extensive information databases, and allows them to communicate electronically with Digital customer support centers (CSCs).

Digital's comprehensive support services for VAX 9000 systems keep the computers running and cut potential problems down to size.

Adding a Finishing Touch

Recommended support services not provided automatically or covered in the standard product warranty are enterprise integration planning, which manages the introduction of the VAX 9000 system into the customer's business, and the services of a customer support engineer, who provides high-level operational support and cost-effective service plans.

Bridging the Gaps

HIGH-PERFORMANCE EXTENDED LANS

Is your enterprise network too big for its bridges? As local area networks (LANs) grow to support enterprise-wide applications, stability and manageability become increasingly critical issues. High-performance bridge products address these issue by connecting LANs to create one extended LAN, and by managing the flow of data traffic between them transparently.

Performance is a key factor to consider in selecting such a device for your network. Digital's high-performance bridges ensure quality network performance for the user, even in a lightly loaded network, and a more responsive, productive LAN. These benefits are especially important as LANs become larger and more complex.

Centralizing Management

The configuration, fault, performance, and security management capabilities of any Digital LAN bridge in an extended LAN can be centrally accessed and modified using Remote Bridge Management Software (RBMS). RBMS V2.0 adds support for LAN Bridge 150 and 200 capabilities, including the following:

- Management of LAN Bridge 200 source-address and protocol filtering.
- Presentation of realtime LAN utilization and throughput information provided by the LAN Bridge 200.
- Purging of the LAN Bridge 200 forwarding database.
- Management of LAN Bridge 150 and 200 password protection.
- Management of software switch that locks LAN Bridge 150 and 200 into IEEE 802.1 spanning tree mode.
- Improved user interface (command line recall, support for command files, enhanced error messages and error handling).

Digital's second-generation extended LAN bridge products – the LAN Bridge 150 and the LAN Bridge 200 – provide the features and performance needed to respond to increasing network demands. These bridges are designed to comply with IEEE 802.1, IEEE 802.2, and IEEE 802.3 standards, and assuring interoperability in multi-vendor networks. And to optimize network management, Remote Bridge Management Software (RBMS) V2.0 supports these new bridges.

Features Allow Configuration Flexibility

Either of these high-performance LAN bridges can link two IEEE 802.3/Ethernet LANs to create an extended LAN far beyond the standard Ethernet limit of 2,800 meters. Four media types – fiber optic cable, standard baseband coaxial cable, ThinWire Ethernet cable, and broadband coaxial cabling – can be used to connect workgroups, buildings, and campuses together. Using several bridges and fiber optic cabling, a number of LANs can be configured to span up to 44,000 meters.

Because they are intelligent devices, the LAN bridges adjust to network configuration changes and update their memories automatically. This dynamic address learning automatically identifies system locations within the extended LAN.

An automatic configuration algorithm known as Transparent Spanning Tree simplifies network management by establishing a loop-free network. It also provides automatic backup, using redundant bridges, to ensure network availability. This algorithm was developed by Digital in the mid-1980s and subsequently accepted by the IEEE 802.1 standards committee with minor implementation differences. The LAN Bridge 150 and 200 support both IEEE 802.1 and Digital LAN Bridge 100 spanning tree implementations.

This autoconfiguring feature detects the addition, removal, and relocation of other bridges on the network. Users can

build a network without risk of faulty configuration. Extended LANs can therefore evolve as needed, without extensive planning.

Digital's Top of the Line Bridge

As a major addition to Digital's bridge product family, the LAN Bridge 200 provides a high-functionality backbone bridge while simultaneously providing very high performance. It optimizes available bandwidth by determining traffic flow automatically, thus preventing bottleneck situations during peak traffic.

Optional source address and protocol filtering features in the LAN Bridge 200 allow for greater network control by minimizing propagation of network problems, while increasing security and bandwidth utilization. The fiber optic capability of the LAN Bridge 200 allows bridge-to-bridge connections spanning distances of up to 10 kilometers, using

62.5/125 or 50/125 micron multimode fiber optic cable.

The LAN Bridge 200 filters data at 29,760 packets per second and forwards data at 14,880 packets per second. These rates, the maximum allowed by IEEE 802.3/Ethernet specifications, exceed the LAN Bridge 100/150 data rates.

Other functions can occur simultaneously, such as loop detection and response to RBMS commands, thus ensuring that the bridge is accessible and can be managed or configured even under heavy traffic loads. Password protection for bridge management functions prevents unauthorized modification of bridge parameters.

Other LAN Bridge 200 features include the following:

- Enhanced network monitor functions that provide key traffic statistics and problem identification while the bridge actively forwards and filters traffic.
- Standards-based fiber optic link fault detection, which discovers a broken or unconnected link. This key diagnostic feature is supplemented by Digital's design, which goes beyond the specified standards to provide additional network troubleshooting capability.
- Node address learning that can be optionally disabled with RBMS V2.0, providing flexibility in determining which nodes have access to the extended LAN. This feature also allows for greater network security.

Three versions are available: local, 3-kilometer fiber optic, and 10-kilometer fiber optic. Port A of each version allows selection between ThinWire and thickwire IEEE 802.3/Ethernet segments. Port B accommodates thickwire IEEE 802.3/Ethernet LANs or fiber optic connections, depending upon the version ordered. Broadband connections are possible using an external modem.

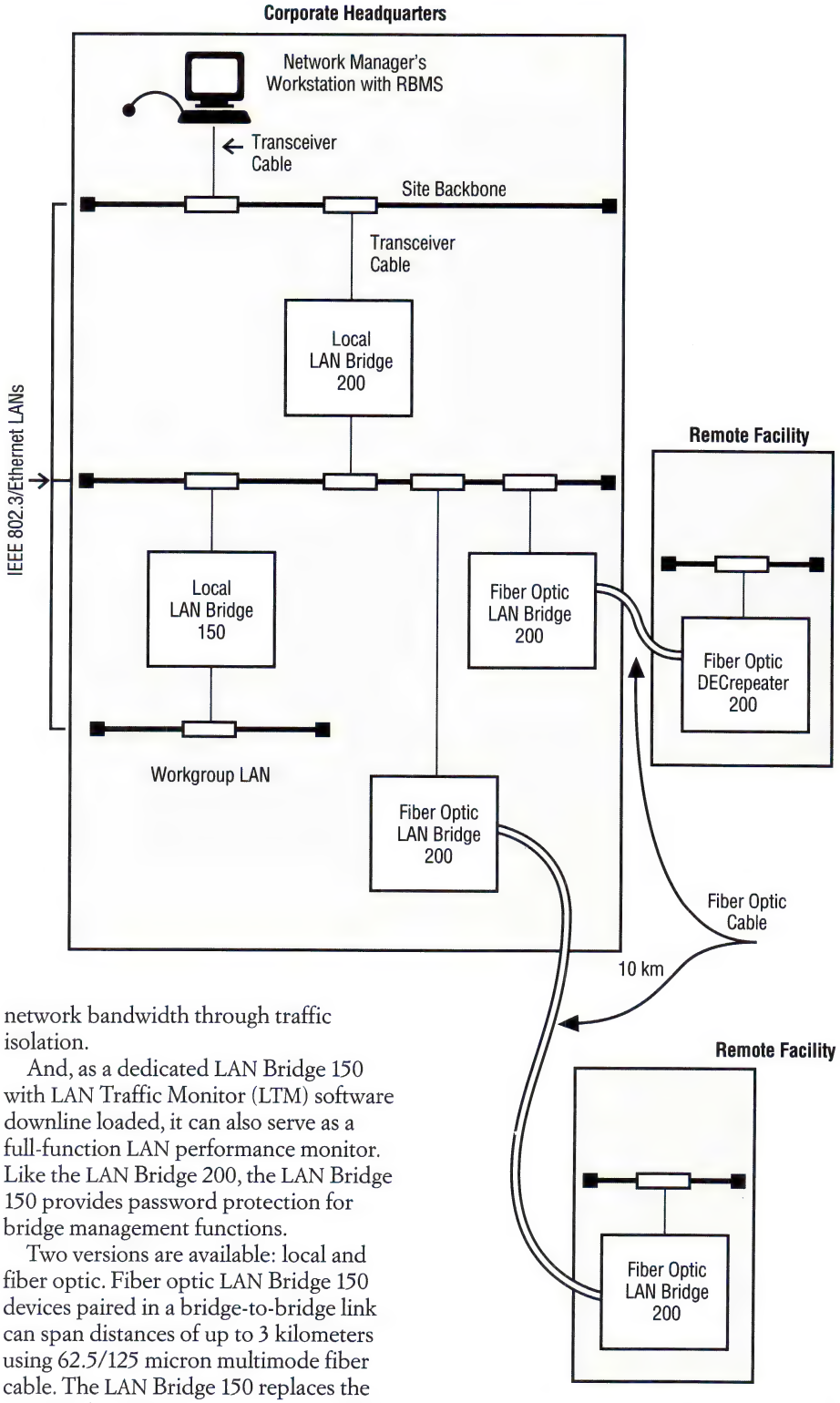
Choosing a Lower-cost Alternative

A functionally enhanced LAN Bridge 100, the LAN Bridge 150 is a lower-cost alternative for networks that do not need the long-distance fiber optic capability or higher functionality of the LAN Bridge 200. A simple way of linking LANs, it increases the computing resources available to users by managing valuable network bandwidth through traffic isolation.

And, as a dedicated LAN Bridge 150 with LAN Traffic Monitor (LTM) software downline loaded, it can also serve as a full-function LAN performance monitor. Like the LAN Bridge 200, the LAN Bridge 150 provides password protection for bridge management functions.

Two versions are available: local and fiber optic. Fiber optic LAN Bridge 150 devices paired in a bridge-to-bridge link can span distances of up to 3 kilometers using 62.5/125 micron multimode fiber cable. The LAN Bridge 150 replaces the LAN Bridge 100. An upgrade is available for installed LAN Bridge 100 devices.

With the flexibility in performance and functionality available now from Digital's bridge products, you can satisfy the growing LAN needs of both users and network managers.



LAN Bridge products provide a high-performance 802.3/Ethernet connection for local LANs or between local and remote sites. Using fiber optic cable, the LAN Bridge 200 can link sites up to 1.5 kilometers apart in conjunction with the DECrepeater 200. A version of the LAN Bridge 200 can achieve distances up to 10 kilometers.

Qualcomm's Network Management Control center coordinates communication between each trucker, the satellite, and the dispatch center.

Qualcomm Network

OPENING THE ROAD TO COMPUTING SUCCESS

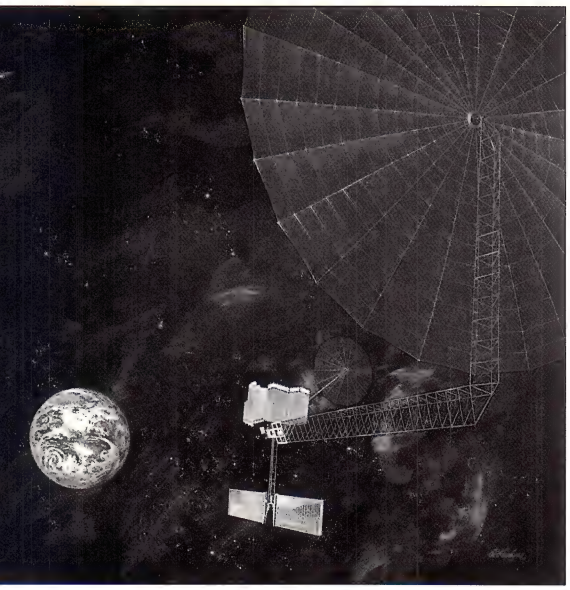
Imagine that you are a driver for one of the nation's largest trucking companies. Heavy snow and stormy night skies impede your vision as you attempt to make that last run for the evening. Your payload: 27,000 pounds of explosives that must be delivered on time.

Suddenly, the left front tire blows out and your truck skids to a halt in a ditch! What do you do? Well, if your truck is equipped with an OmniTRACS* two-way mobile communication system, you are in good shape.

Qualcomm, Inc., a leading telecommunications and information processing firm, designed the OmniTRACS system. This satellite-based, mobile communication system provides realtime, two-way messaging between trucks and operations centers while pinpointing vehicle location.

With the OmniTRACS system, every driver has a terminal, suitable for rugged conditions, installed in the truck cab. The terminal is connected to an antenna unit that uses existing satellite frequencies, known as the KU band, to maintain a reliable connection between each truck on the network and the Qualcomm Network Management Control center earthstation in San Diego. Dispatch centers are able to communicate with the Network Management Control center regardless of the type of network or protocols they are using.

"The Network Management Control center is based on a VAXcluster configuration," said Franklin Antonio, vice-president of advanced engineering. "We are dispatching messages from this center to



customers all over the United States. For the most part, these customers are receiving their information on midrange IBM systems and PCs via SNA and asynchronous links creating a very wide area network."

Qualcomm's networking strategy follows the model set by Digital's Strategic Networking Vision (DSNV). The DSNV features a comprehensive framework that defines connectivity, interoperability, distributed applications, and manageability across networks. Each component works together to provide the service that Qualcomm requires for its customers.

Network Communication on Wheels

Qualcomm uses Digital's computer products at the Network Management Control center as part of a wide area network (WAN) and a local area network (LAN). Both networks are considered vital and are fully integrated by Qualcomm. The WAN allows Qualcomm to maintain constant contact with its customers' networks across the United States.

"The LAN is used by Qualcomm for internal operations and runs DECnet software with a TCP/IP protocol," said Antonio.

The Network Control Center monitors and controls traffic between dispatchers, the satellite, and eventually, the trucker. For example, emergency messages on the open road, even in the most desolate reaches of the country, can be communicated instantly to dispatch, which can then alert local authorities for assistance.

Because shipping orders can be communicated to the driver in realtime, just-in-time shipments can be constantly tracked. If a delay is imminent, the shipper can be notified and adjustments to the manufacturing lines can be made. Changes to shipping orders can also be communicated directly to the driver, avoiding unnecessary travel and saving money.

Mapping the Path to Integration

Connectivity is the ability to move any piece of information from point A to point B regardless of the media or transmission technologies. This means that all devices from the desktop to the computer room must have an equal opportunity to connect to and be part of the network. Qualcomm uses T1 links to connect with other facilities and networks.

Connectivity is just part of the Qualcomm solution. All system elements at each location must exchange information between equipment, whether it's from the same or different vendors – this is called interoperability. Considering that 90 percent of its customers use IBM* computers, interoperability is crucial to Qualcomm's business.

"Qualcomm's VAX computers communicate with a diverse group of systems including IBM 3090, System/38,* AS/400 systems, personal computers, Wang* and Prime* systems," said Antonio.

Diversity Drives Power and Flexibility

The heterogeneous computing environment within Qualcomm exemplifies network-wide interoperability. Qualcomm's LAN operations use Hewlett-Packard computers for mechanical design and solid modeling, microwave, IC (MMIC) design, and Sun computers to do very large scale integration (VLSI) applications. Its network also supports 240 Macintosh* computers connected to the Ethernet through AppleTalk* gateways and 160 personal computers that perform engineering, simulation, data entry, and word processing and presentation graphics. E-mail, file serving, and source control like the Code Management System (CMS) are just a few applications that are distributed on the Qualcomm network.

How does one manage a growing and diverse network like this? Qualcomm's solution is based on DECnet software with its inherent network management capabilities. In addition, a totally redundant VAXcluster system configuration consisting of two VAX 6310 systems supports both internal engineering and external customer operations. An uninterruptable power supply combined with backup generators ensures complete system reliability, something that Qualcomm's customers require.

The four components of the DSNV – connectivity, interoperability, distributed applications, and network management – have shaped a reliable network that ensures smooth operations for Qualcomm's customers under the toughest conditions.

*OmniTRACS is a registered trademark of Qualcomm, Inc. Macintosh is a registered trademark of Apple Computer, Inc. IBM is a registered trademark and System/38 is a trademark of International Business Machines Corp. Prime is a registered trademark of Prime Computer, Inc. Wang is a registered trademark of Wang Laboratories, Inc. AppleTalk is a registered trademark of Apple Computer, Inc.

Realtime Networking Solutions

Why did Qualcomm choose Digital's realtime solutions?

"Digital knows how to build machines that can really operate in a realtime environment," explained Tom Lafleur, the director of engineering services. "And Digital knows how to build operating systems that can operate in a realtime environment."

Qualcomm looked at other vendors to satisfy its complex realtime requirements and selected Digital because of its flexible solutions for meeting customers' needs.

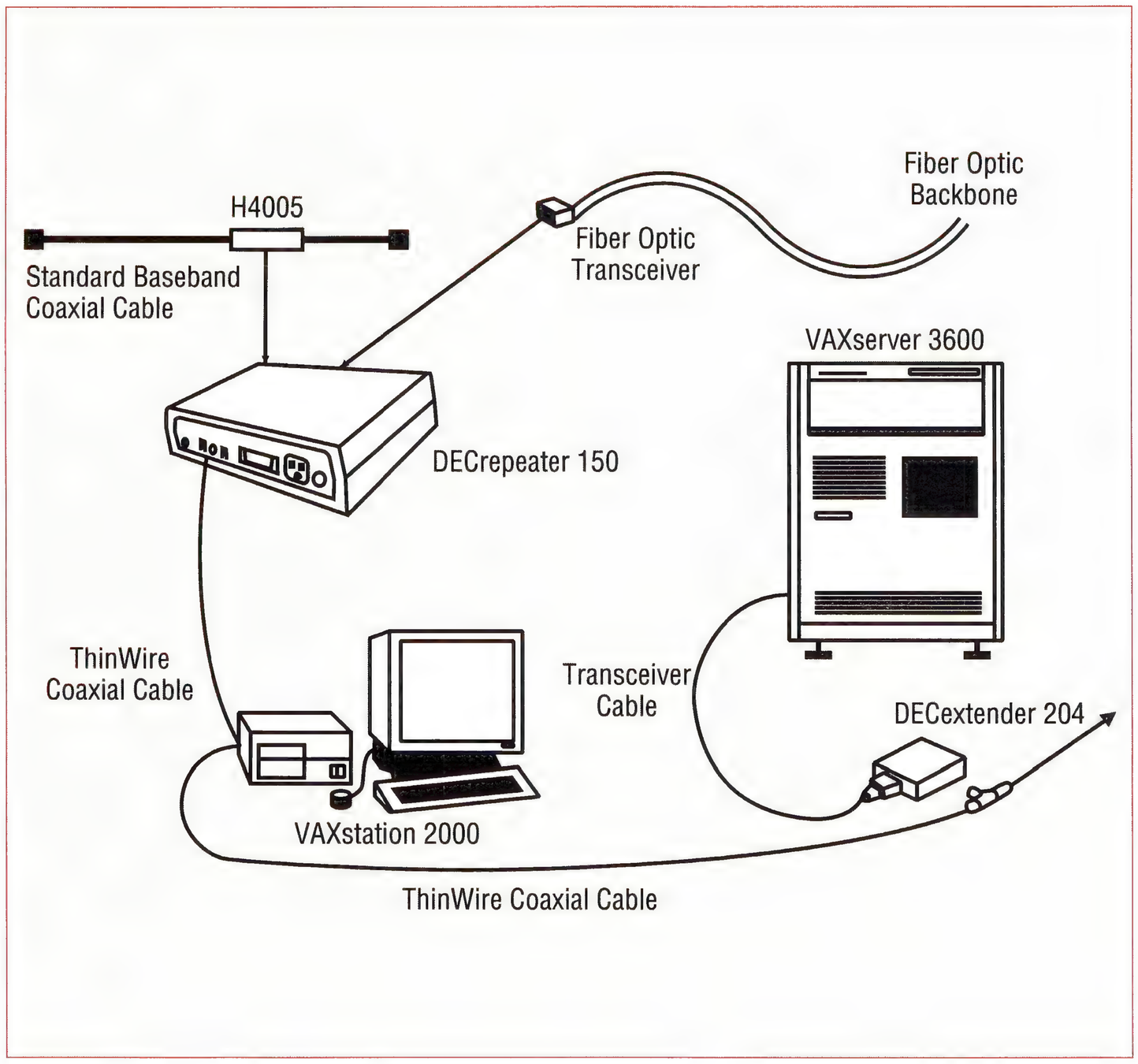
ThinWire Ethernet Update: Connecting PCs with Ease

PC LAN users rely on connectivity products such as repeaters and adapters in order to function as full and equal members on a backbone network. Now, changes in ThinWire products – the DECrepeater 150 and the DECextender 204 – increase reliability and improve cost-effective access from isolated PCs to network resources and services.

The DECrepeater 150, a ThinWire Ethernet single-port repeater, connects devices equipped with a ThinWire (RG58-type) coaxial BNC connector to an 802.3/Ethernet backbone via an industry standard 15-pin AUI/transceiver connector and transceiver cable. Known as DESPR-AA/AB in its previous version, the repeater is now available in a more compact package designated as DESPR-EE/EF.

The DECrepeater 150 is suited to both desktop and wall-mounted applications. When used in conjunction with the H9544-MK universal rack mounting shelf kit, it can fit into an industry-standard 19-inch rack or enclosure. The die-cast aluminum enclosure provides convection cooling, thus eliminating the need for a fan.

Changes to the DECrepeater 150 provide an increase of 250 percent in MTBF (mean time between failure) and improved RFI (radio frequency interface) capability over the previous repeater. And separate LEDs for power and port status allow for easier network diagnosis.



The DECrepeater 150 (DESPR) connects devices equipped with a ThinWire coaxial BNC connector to an 802.3/Ethernet backbone. The DECextender 204 (DESTA) converts a standard Ethernet controller or AUI station to a ThinWire cable.

Station Adapter Isolates Media Faults

The DECextender 204, a ThinWire Ethernet station adapter, converts a standard Ethernet controller or A.U.I. station equipped with a 15-pin connector to a ThinWire cable. The adapter designation is DESTA-BA (changed from DESTA-AA).

By using the same enclosure as the H4005 transceiver, the DECextender 204 saves cost through more efficient manufacturing. A new short-detection circuitry feature in the DECextender 204 isolates network media faults, thus preventing data packet loss that can occur as a result of cable shorts. It supports the serial connection of as many as 30 stations for each 185-meter ThinWire segment.

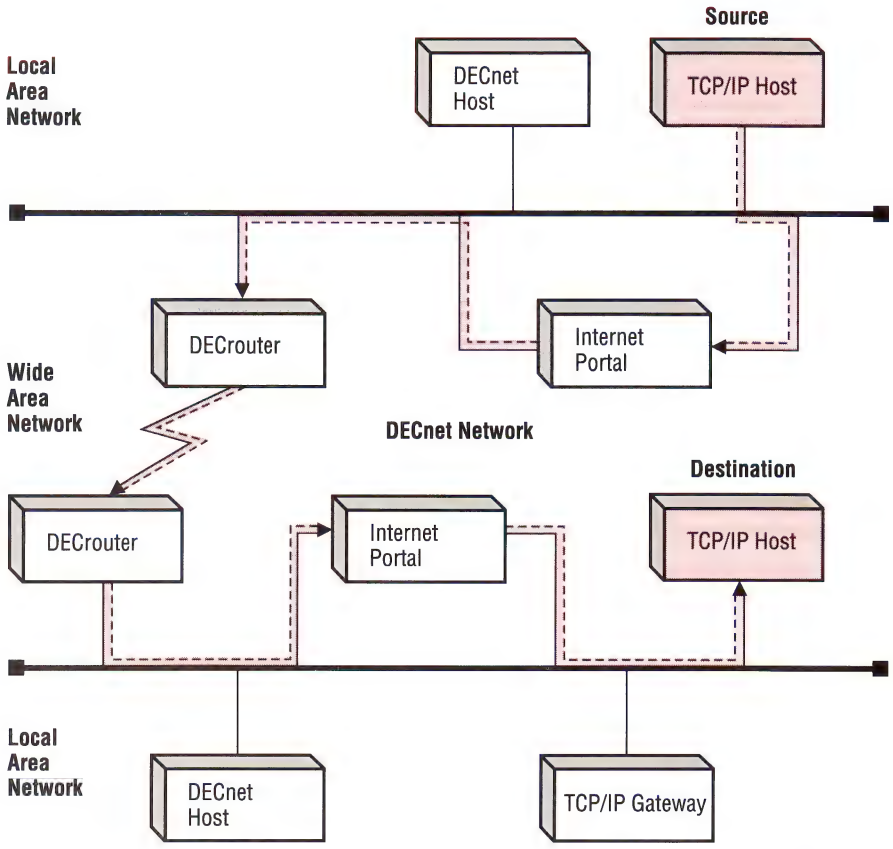
TCP/IP Renaissance Prompts the INTERNET Portal

The speed of RISC computers has reinvigorated interest in UNIX* operating systems and TCP/IP networking. UNIX workstations are sprouting up in installations previously populated solely by minicomputers, personal computers, and terminals.

Internet Portal V1.0 accommodates these new, fast UNIX processors with their TCP/IP networking requirements into an existing DECnet backbone. Installations with an investment in DECnet products can now achieve multi-operating system connectivity with TCP/IP computers easily and inexpensively.

The Internet Portal works as a server to a TCP/IP system that needs to communicate with another remote TCP/IP system. The Internet Portal encapsulates IP datagrams into DECnet packets, and then passes the information through a DECrouter node, over the wide area network, and through another DECrouter. The packets are then de-encapsulated at the receiving end by another Internet Portal.

The approach exemplified by the Internet Portal enables the backbone to handle additional protocols without having to add new routers, new transmission lines, or a new network management domain.



One TCP/IP system can send and receive information from another TCP/IP system over a DECnet network. The Internet Portal processes data at transfer rates of 1,500 packets per second.

Building on DECnet Tenets of the Past

Built on the DECsystem 3100 processor, the RISC-based Internet Portal joins a network as a diskless server.

The Internet Portal operates as a DECnet node on the backbone. Thus, a system manager may access the device remotely via the DECnet Network Control Program (NCP) to examine and modify various parameters of the system.

Orderable as a single item, the Internet Portal includes 8 Mbytes of memory. The device also comes packaged with an Ethernet interface, ThinWire or thickwire connections, and a serial port for terminal connection.

Another solution, also offered under a single order number, includes the DECrouter 2000 product. This configuration – the DECnet/Internet Router 2000 – costs less than a separate portal and router.

By encompassing UNIX systems with the Internet Portal, DECnet installations have just introduced another way in which to incorporate multiple networking protocols while protecting investment.

*UNIX is a registered trademark of American Telephone & Telegraph Company.

ALL-IN-1 System

SHAPING THE OFFICE OF THE '90s

Yesterday, an easy-to-use menu of office applications could serve both large and small workgroups. Today, office users demand more. They want access to more information and more sophisticated applications. Tomorrow, the offices of the '90s will require an unprecedented level of computing power and flexibility, plus a broad range of applications, network resources, and worldwide information services.

Digital's ALL-IN-1 Phase II program represents a major evolutionary step for integrated office systems. With ALL-IN-1 V2.4 software as a centerpiece, the ALL-IN-1 Phase II program delivers new capabilities to the Digital installed base – and other groups requiring access to powerful computing resources from a variety of popular computing devices.

By following the client/server computing model, ALL-IN-1 V2.4 software brings a broad range of extended network services to desktop clients, including work-

stations employing the DECwindows interface and personal computers running the MS-DOS* operating system. Yet, the ALL-IN-1 V2.4 Server maintains compatibility with standard video terminals, ensuring investment protection for customers. ALL-IN-1 Desktop for MS-DOS V1.0 software protects personal computer investments, while ALL-IN-1 Desktop for VMS DECwindows on VMS V1.0 software preserves X Window System* investments.

Packaged as either "System" or "Personal" licenses, ALL-IN-1 V2.4 software supports Digital's expanding base of Network Application Support (NAS) standards, such as CDA (Compound Document Architecture). New electronic mail and decision-support packages, also part of ALL-IN-1 Phase II, are discussed in related articles on pages 22 and 23. A suite of group applications (calendaring, VAX Notes conferencing, and word processing document management software) are included. Integration, training, and support programs for ALL-IN-1 Phase II complete the picture.

The major new features and functionality found in ALL-IN-1 V2.4 follow the client/server model for delivering server-based capabilities to VT, PC, and DECwindows software-based workstation clients. Support for Digital's Document Interchange Format (DDIF) allows users to send, forward, and receive DDIF documents by mail; store DDIF documents in the ALL-IN-1 File Cabinet; export DDIF documents from the ALL-IN-1 File Cabinet to VMS storage; read DDIF documents; convert DDIF documents to different formats (ASCII, DX, WPS-PLUS, and Alternate Format Syntax – AFS); edit, and print DDIF documents.

The Centerpiece: ALL-IN-1 V2.4

ALL-IN-1 V2.4 software simplifies a user's work by integrating more applications. Staff employees, department managers, MIS, and applications developers working with multivendor systems and networks all benefit from ALL-IN-1 application integration/development tools and core office applications.

Like previous releases, ALL-IN-1 V2.4 software is a menu-based product that can be customized. Additionally, ALL-IN-1 V2.4 becomes the server for the newly announced MS-DOS and DECwindows desktop clients. ALL-IN-1 consists of an integrated subsystem (document processing, electronic mail, calendar management, and office file cabinet), tools for integrating personal and business applications and for tailoring workflows to suit individual needs, and system management services for monitoring resources, capacity planning, and system security.

With this announcement, the ALL-IN-1 integrated subsystem has been expanded

to include ALL-IN-1 group conferencing services. This new service, VAX Notes, has been modified and integrated into the ALL-IN-1 menu.

Support Added for DECwindows, PC Clients

Support for MS-DOS-based personal computers and VMS DECwindows software-based workstations in ALL-IN-1 demonstrates Digital's goal of a computing environment with distributed, multivendor applications running seamlessly in a client/server architecture.

Today more than 700,000 PCs are connected to ALL-IN-1 systems, ALL-IN-1 provides PC integration capabilities that meet a wide range of critical customer needs. These capabilities, provided by ALL-IN-1 Desktop for MS-DOS and ALL-IN-1 Server for VMS software, enable PC users to take advantage of PC-based resources and applications on the desktop – including WPS-PLUS/DOS editing, mail creation, and document filing and transfer features – while accessing services made available by the ALL-IN-1 V2.4 Server.

Network-based services include application and file cabinet integration, mail processing for remote PCs, and ALL-IN-1 VMS-based file system integration.

ALL-IN-1 V2.4 becomes the server for the newly announced MS-DOS and DECwindow desktop clients.

ALL-IN-1 Server for VMS software allows an ALL-IN-1 system to arrange for scheduling, mail routing and sorting, user management, and access to the ALL-IN-1 file cabinet and printers.

ALL-IN-1 Desktop for VMS DECwindows V1.0 software gives workstation users easy access to the integrated office applications and services provided by ALL-IN-1 from their native operating environment. This product accesses CDA-compliant applications such as DECwrite and DECdecision software, enabling file and document storage in the file cabinet, and printing, mailing, and viewing of multiple windows.

An initial, icon-based user interface to ALL-IN-1 applications, desktop startup, and hot-key access to ALL-IN-1 are provided by ALL-IN-1 Desktop for VMS DECwindows V1.0 software. The single-user license covers DECwindows, ALL-IN-1 Mail Server, VAX Notes, the CDA Conversion Library, and ALL-IN-1 Desktop for VMS DECwindows software. The ALL-IN-1 Desktop Package for VMS DECwindows V1.0 adds single-user licenses for DECwrite, DECdecision, and VAX VTX software.

From the desktop to the data center, no other vendor can supply fully integrated office systems with the level of network services and applications support provided by Digital. The growing customer demand for flexibility, ease-of-use, and investment protection leads inexorably to ALL-IN-1.

*MS-DOS is a registered trademark of Microsoft Corporation. X Window System is a trademark of the Massachusetts Institute of Technology.

ALL-IN-1 Mail Easily Traverses Multivendor Boundaries

Electronic mail is the preferred carrier for data in the office. While some computer applications struggle for acceptance, electronic mail is as readily embraced as the telephone.

Digital's ALL-IN-1 systems have always offered leadership electronic mail services to users. Now, ALL-IN-1 Phase II extends Digital's electronic mail capabilities to integrate the enterprise from the desktop to the departmental and organizational levels.

ALL-IN-1 Phase II incorporates the following new electronic mail products: ALL-IN-1 Mail Server for VMS, ALL-IN-1 Mail for MS-DOS V1.0, and ALL-IN-1 Mail for VMS DECwindows V1.0 software.

These applications are based on the client/server computing model, in which a centrally located server system running ALL-IN-Mail Server for VMS software "dispenses" applications, data, and resources over high-speed network connections to connected clients. Clients may include MS-DOS*-based personal computers and VMS DECwindows workstations.

MAILbus: The Only Passport Needed

Digital's ALL-IN-1 mail products are built around the MAILbus multivendor interconnect, a single core set of services based on international standards (CCITT X.400) for electronic mail delivery.

MAILbus services provide effortless electronic messaging connections among ALL-IN-1, PROFS*, SNADS, ULTRIX, VMSmail, and other X.400 mail agents. MAILbus services are layered on the DECnet/OSI Phase V Open Network environment, ensuring multivendor system integration capabilities for existing and future Digital mail solutions.

Together, ALL-IN-1 mail and MAILbus services extend the business communications support within Digital's Network Application Support strategy.

ALL-IN-1 Mail: A Proven Traveler

ALL-IN-1 Mail Server for VMS software is available in local and wide area network packages. It offers all standard capabilities of other vendors' electronic mail products, including store and forward services, message delivery notification, and data about messages and users. Other powerful features distinguish the ALL-IN-1 Mail Server from its competition, such as access to Digital's Distributed Directory Service (DDS), network filing services, MAILbus multivendor interconnect services, and support for the Compound Document Architecture (CDA).

Because a single ALL-IN-1 mail server supports many types of clients, system management is simplified and cost savings can be significant. Easy configuration allows efficient allocation of system resources. With support for multilingual client systems on the same server, ALL-IN-1 mail is an international product; even error messages can be displayed in the user's choice of languages.

ALL-IN-1 Mail for VMS DECwindows V1.0 software, a full implementation of ALL-IN-1 mail for the DECwindows interface, enables existing workstation users to access the power of ALL-IN-1 mail, along with other world-class DECwindows business applications such as DECwrite and Acumate*.

The ALL-IN-1 mail package for personal computer clients – ALL-IN-1 Mail for MS-DOS V1.0 software – helps users make the most of their desktop computers. Remote dial in enables mail to be collected and delivered in batches, for maximum convenience and management of communications costs.

Wherever your electronic messages are going, ALL-IN-1 Mail is a reliable way to get them there – even when the destination is a non-Digital system.

*Acumate is a trademark of EFFEM Corporation. MS, MS-DOS are registered trademarks of Microsoft Corporation. PROFS is a trademark of International Business Machines Corporation.

Office of the '90s: Computers Figure in Decisions

Spreadsheets and database applications were the first wave of decision support tools for business professionals. Eighty percent of the professionals in Fortune 1000 accounts, which as a group now constitutes the largest single desktop application market – according to the Gartner Group's Personal Computing Division – use at least one of these applications.

But a new generation of applications is emerging with capabilities that go far beyond the limited boundaries of their predecessors. These applications can exchange data with other applications, extract and manipulate data from a VAX, IBM, or any other system, and use technology derived from object-oriented and expert systems. Such capabilities make it easier for users to gain a new understanding of complex data relationships and integrate information throughout an organization's network.

Digital's business intelligence applications illustrate how this new generation of decision support tools anticipates the requirements of the '90s. By teaming with marketing partners, Digital offers a complete portfolio of applications for decision support on video terminals, PCs, and workstations. And Digital surrounds this portfolio with the added value of integration – across desktop devices, through desktop applications, and by linking corporate data from any source.

Processing a Range of User Needs

DECdecision software exemplifies the best of the new generation of decision support solutions. When run in the DECwindows desktop environment, DECwindows applications allow users to access data, transform it into usable information, and distribute it in a range of formats such as pie charts and bar graphs.

Data can be exchanged between DECdecision applications and other applications. Data from DECdecision applications can be included and updated automatically in a DECwrite document through the LiveLink feature of CDA (Compound Document Architecture).

For spreadsheet users, the 20/20™ DECwindows product from Access Technology, Inc., is a powerful desktop spreadsheet solution. Combining spreadsheet, database management, graphics, and advanced data consolidation capabilities, 20/20 DECwindows works with Digital's building block products such as VAX Rdb/VMS and ALL-IN-1 software. 20/20 DECwindows is available on MS-DOS*, UNIX*, and other operating systems.

Gaining an Advantage with Digital

The three major suppliers of executive information systems – Comshare, Execucom, and Pilot – offer solutions that run on Digital platforms. But there is a Digital difference. Digital's application connectivity means these solutions can have more power than the same solutions running on other platforms.

Executives get explicit summary data about their organizations, but then can quickly communicate their business decisions through office tools as electronic mail and videotex.

Among financial departments, a leading decision support tool is Paradigm from Execucom. Paradigm allows easy access to corporate data (through VAX Rdb software), financial modeling applications, and DECwrite compound documents. Paradigm runs under the DECwindows software interface, and offers users a consistent graphical presentation.

Acumate™ for DECwindows from EFFEM Services, Inc., is a sophisticated data handling, analysis, and development tool. It combines distributed multidimensional database management with dynamic SQL links, external data feeds, statistical analysis, and comprehensive modeling and presentation. Acumate for DECwindows allows users to retrieve and analyze data from a wide variety of platforms and sources, and to model and present the resulting intelligence in a variety of forms.

Applications within the business intelligence portfolio, which fully exploit the capabilities of Digital's open environments, share a set of powerful attributes. They can tie users to data regardless of source, communicate complex data and information among themselves, and invoke and pass control to other applications.

In short, Digital's applications enable users throughout a corporation to focus their energies and professional skills on solving business problems.

*MS-DOS is a registered trademark of Microsoft Corporation. UNIX is a registered trademark of American Telephone & Telegraph Company.

Desktop News

You have a choice of several monitors for the VAXstation 3100 workstations. Shown here are a VR297 monitor on a VAXstation 3100 Model 38 workstation in the foreground, and a 19-inch VR299 color monitor on a VAXstation 3100 Model 48 workstation in the background.
VAXstation 3100 M38

See the Boost

VAXstation PROCESSES 40 PERCENT FASTER

More power to the punch. That's what makes Digital's VAXstation 3100 workstations ideal for running high-performance graphics applications. And new memory, storage, and display devices help direct that punch towards the toughest workstation tasks.

The new VAXstation 3100 Model 38 and 48 workstations, which feature the 60-nanosecond CMOS CPU used in MicroVAX 3800 and 3900 systems, deliver 4.2 times the performance of the VAX-11/780 computer – 40 percent more performance than the earlier VAXstation 3100 workstation models.

The VAXstation 3100 Model 30 and 40 workstations, which incorporate the 90-nanosecond CMOS CPU used in MicroVAX 3500 and 3600 systems, offer 2.8 times the performance of the VAX-11/780 machine.

Each VAXstation 3100 workstation provides an integrated computing environment that combines desktop VAX computing with industry-standard personal productivity tools and transparent access to distributed applications and resources. By utilizing the capabilities of the DECwindows windowing interface, these systems enable users from novice to expert to access the power of networking through their desktop applications.

More Memory Fuels System Engine

To provide users with flexible memory configurations, Digital offers new 8-Mbyte memory boards for the VAXstation 3100 workstations. A new storage disk with more storage capacity increases memory options even further (see related article on page 26).

The VAXstation 3100 Model 30 system now supports up to five storage devices, while the VAXstation 3100 Model 40, 38, and 48 workstations support up to seven devices each. Digital's new RZ56 storage disk, a 665-Mbyte hard disk, is also available for all VAXstation 3100 systems.

The VAXstation 3100 Model 40, 38, and 48 systems also offer a dual small computer system interface (SCSI). This interface enables the workstations to accommodate many industry-standard SCSI peripherals.

Shifting into Drive with New Monitors

Digital provides a new monitor for the VAXstation 3100 workstation. The VR297 monitor is a 16-inch color display monitor that utilizes Trinitron* technology.

Upgrades are available for customers with a VAXstation 3100 Model 30 or 40 system already installed who want to obtain the benefits of the faster VAXstation 3100 Model 38 and 48 systems. The package includes a CPU board for diskless workstations, a new board and disk controller for standalone systems, and updated documentation.

Owners of VAXstation 3100 Model 38 workstations can upgrade their systems themselves by installing mass storage devices, an eight-plane graphics board, and additional memory modules.

With these enhancements and new capabilities, the VAXstation 3100 workstations lead the way in affordable, reliable, and successful computing.

*Trinitron is a trademark of Sony Corporation.

VAXstations Gain a PC Feel

Digital offers an optional coprocessor for all VAXstation 3100 workstations that allows users to use MS-DOS* operating system applications on their workstations through the DECwindows software interface.

The VAXpc for VMS Software coprocessor enables VAXstation 3100 workstations to emulate the instruction set of the Intel 80286 microprocessor. This permits VAXpc windows to appear on VAXstation 3100 systems as they do on personal computers.

With the VAXpc coprocessor, users can "cut" information from any industry-standard PC application and "paste" them into DECwindows software applications.

*MS-DOS is a registered trademark of Microsoft Corporation.

VAXstation Monitor Specifications

Display Monitors

19-inch color (VR299)	Height: 47.0 cm (18.5 in); Width: 50.6 cm (19.9 in) Depth: 52.5 cm (20.7 in); Weight: 32.0 kg (71.0 in)
19-inch monochrome (VR262)	Height: 39.5 cm (15.6 in); Width: 45.0 cm (17.7 in) Depth: 43.0 cm (16.8 in); Weight: 18.6 kg (41.0 lb)
16-inch color (VR297)	Height: 40.6 cm (16.0 in); Width: 40.6 cm (16.0 in) Depth: 45.0 cm (17.8 in); Weight: 29.0 kg (64.0 lb)
15-inch color (VR160)	Height: 40.6 cm (16.0 in); Width: 38.1 cm (15.0 in) Depth: 45.7 cm (18.0 in); Weight: 20.0 kg (44.0 lb)
15-inch monochrome (VR150)	Height: 38.1 cm (15.0 in); Width: 38.1 cm (15.0 in) Depth: 36.8 cm (14.5 in); Weight: 18.2 kg (40.0 lb)
Orientation	Landscape (horizontal)
Resolution	1024 Horizontal x 864 Vertical
DPI	78 pixels (dots) per inch (19-inch monitor) 100 pixels (dots) per inch (15-inch monitor) 93 pixels (dots) per inch (16-inch monitor) 75 pixels (dots) per inch (19-inch flat panel monitor)
Refresh	60 Hertz noninterlaced
Ergonomics	Tilt/swivel base, nonglare screen
Controls	Brightness, contrast, DeGauss (color only)

VAXstation 3100 Storage Features

	Model 30	Model 40	Model 38	Model 48
Standard Memory	8 or 12 Mbytes	16 Mbytes	8 or 12 Mbytes	16 Mbytes
VUP[1]	2.8	2.8	3.8	3.8
Disk Controller	SCSI/ST506	SCSI/SCSI	SCSI/SCSI	SCSI/SCSI
Maximum Internal Storage	2 RZ23, 1 RX23 or 1 RZ23, TZ30	3 RZ23, RRD40, TZ30	2 RZ23, RX23, or 2 RZ23, TZ30	3 RZ23, RRD40, TZ30
Maximum External Storage[2]	Up to 5 devices	Up to 4 devices	Up to 7 devices	Up to 4 devices

[1]VAX units of performance (1 = VAX-11/780)
[2]External disks can be held in single or dual storage expansion boxes

SCSI Disk Drive Expands Capacity Cost-effectively

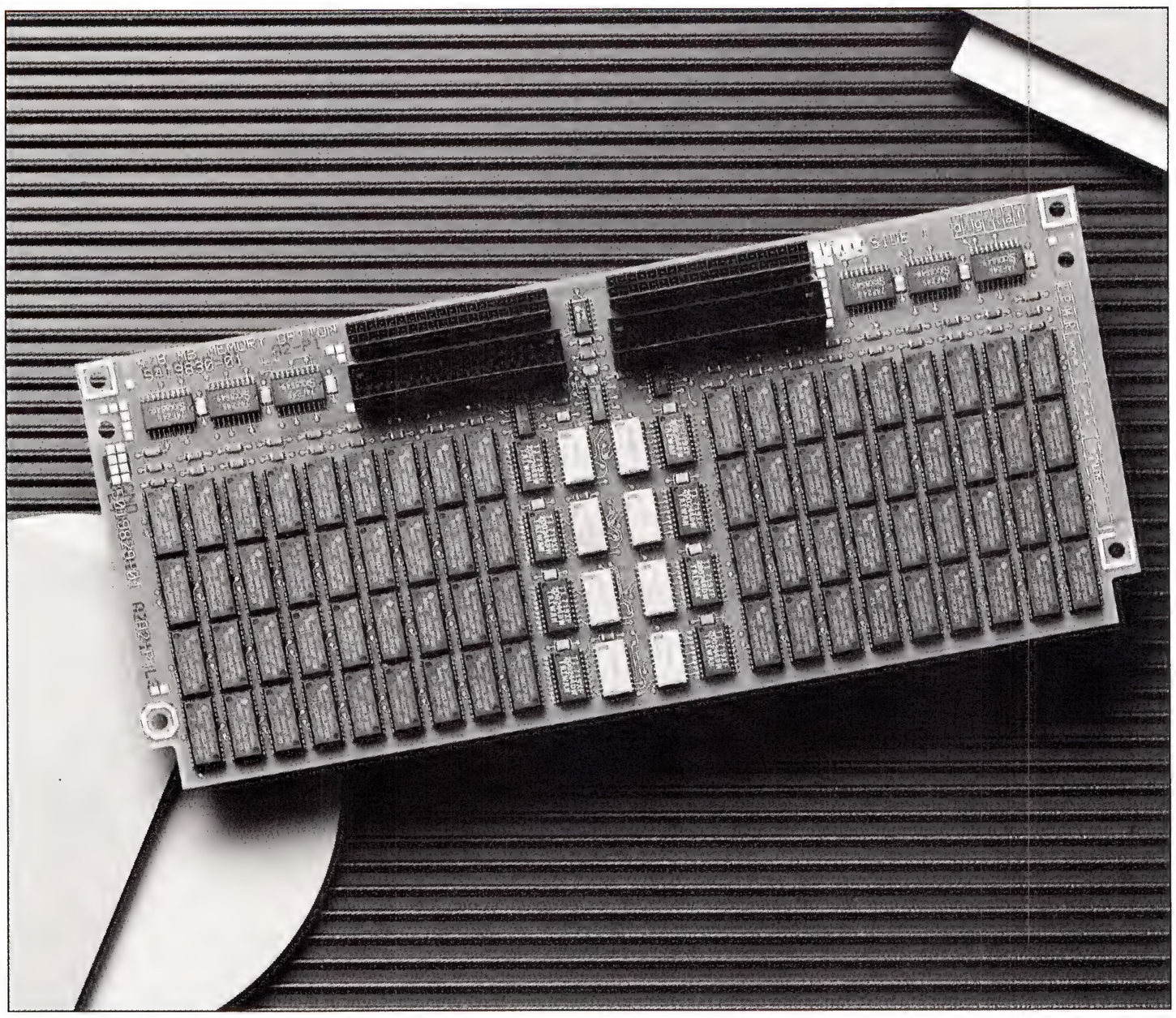
The RZ56 disk drive moves into a leadership slot among SCSI workstation storage products. Offering 665 Mbytes of formatted storage capacity, the RZ56 is a full-height, 5.25-inch drive with one of the lowest price-per-Mbyte ratios in the industry.

Improvements in media density give the RZ56 drive twice the capacity of its predecessor, the RZ55 drive. Thanks in part to a 64-Kbyte buffer, the RZ56 drive's synchronous transfer rate of 4 Mbytes per second meets the performance requirements of both servers and standalone workstations.

For desktop applications, the RZ56 disk drive is packaged in a compact and durable enclosure. This enclosure, which resembles the VAXstation system box, can hold two RZ56 drives for a total storage capacity of 1.3 Gbytes.

But high capacity and speed are meaningless if they are not matched with reliability and serviceability. The RZ56 drive excels in those areas as well. Specifically qualified for use on Digital's SCSI bus, the RZ56 drive has undergone extensive system integration testing to ensure reliable operation. This contrasts with some third-party SCSI storage devices that may periodically hang and become inoperable on Digital SCSI systems, requiring a full system reboot – or worse, causing a loss of data.

In the event of a power failure, Digital's RZ storage products are designed to complete the write operation in progress before powering down. And should the drive's circuitry become damaged, the use of two field replaceable units (FRUs) ensures that the RZ56 drive circuitry can be replaced without affecting the head-disk assembly, thereby preserving your data.



The dual connectors of the MS42-KA 8-Mbyte memory option for VAXstation and MicroVAX 3100 systems enable the attachment of either 4-Mbyte (MS42-AA/AB) or 12-Mbyte (MS42-BA) memory modules. Including the 4 Mbytes of memory on the CPU, the module combinations provide 16- or 24-Mbyte capacity respectively. The maximum memory configuration (32 Mbytes, including 4 Mbytes on the CPU) uses the MS42-CA module (16 Mbytes) in conjunction with the MS42-BA module.

Accessing Q-bus Options

Additional options are available for VAXstation 3520 and 3540 systems thanks to a DWFQA Q-bus adapter and the MS60-CA memory module. The DWFQA Q-bus adapter makes it possible to use Q-bus communications and data storage options with the VAXstation 3520 and 3540 systems.

The following options are supported by the DWFQA Q-bus module: the DSV11-SA/SF/SB/SG controller, the CXY08-AA/AF asynchronous multiplexer, the TK70E-SA/SF magnetic streaming tape drive, and the TSV05-SE/SF magnetic streaming tape drive.

The MS60-CA 32-Mbyte memory module provides up to 128 Mbytes of ECC memory to a VAXstation 3520 and 3540 system. This is achieved by installing four 32-Mbyte memory modules in a dual CPU configuration.

Get a Better Workstation

Trade-in allowances of up to $4,000 are now available for users of VAXstation 2000 and Sun-3/50 and -3/60 workstations from Sun Microsystems who want to purchase the more powerful Model 30 and 40 VAXstation 3100 and DECstation 3100 systems.

Under the trade-in program, VAXstation 2000 and Sun-3/50 workstation users receive a $2,000 trade-in allowance for every system, and a $4,000 trade-in value is offered for each Sun-3/60 workstation. All transactions are one-for-one, and returned equipment must include a CPU with at least four Mbytes of memory, a monitor, and a keyboard.

LA324 MultiPrinter Meets Variety of Printing Demands

Versatility to operate anywhere from the executive office to the factory floor is the cornerstone of Digital's new LA324 MultiPrinter dot matrix printer.

Designed for both desktop and data processing printing tasks, the LA324 MultiPrinter printer produces all types of printed material, from individual business letters to multipart forms. It prints at 100 characters per second in letter-quality mode and 300 characters per second in draft printing mode. The LA324 MultiPrinter printer succeeds the LA120 DECwriter III pedestal-based printer and is an alternative to the LA210 Letterprinter system for the desktop.

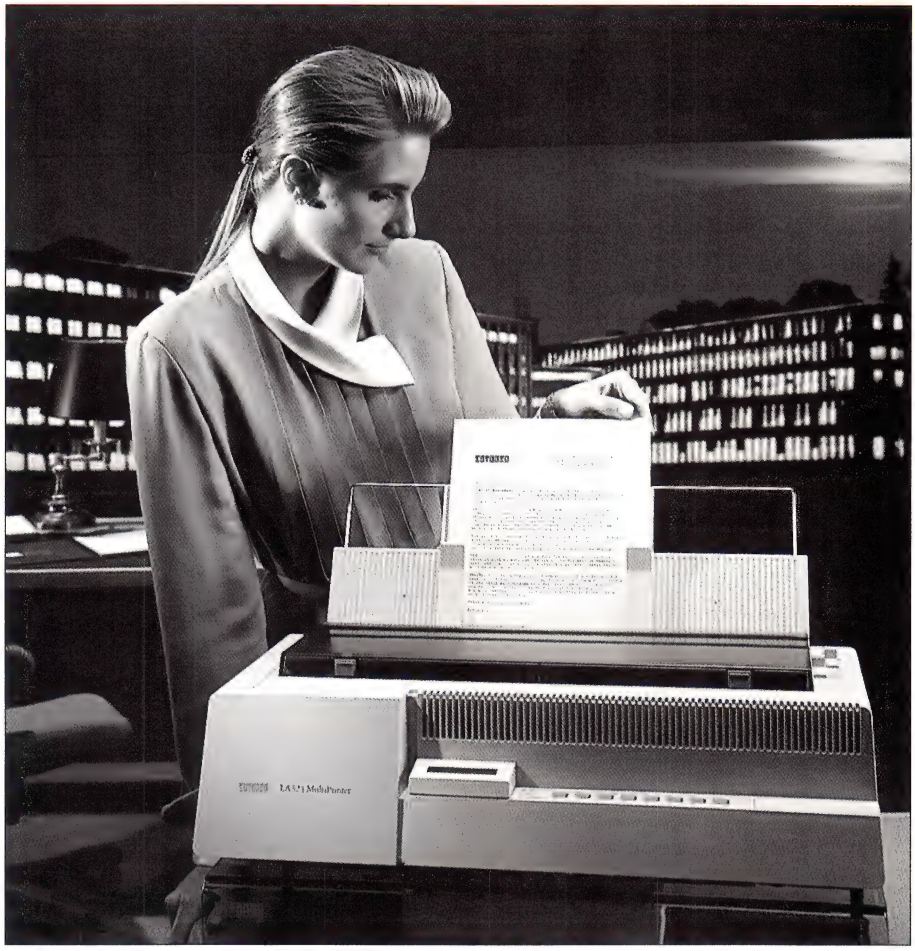
Autoload, document on demand, and automatic park functions are standard.

By incorporating a 24-wire printhead for high-quality text and graphics printing, the LA324 MultiPrinter printer functions reliably in high-volume (up to 5,000 pages per month) environments. With plug-in font and snap-in ribbon cartridges, it prints a variety of font styles in either black or colored ink.

Featuring the latest paper-handling technologies, the LA324 MultiPrinter printer from Digital offers numerous processing options. Autoload, document on demand, and automatic park functions are standard, and an optional automatic sheetfeeder is available.

The LA324 MultiPrinter dot matrix printer uses a wide carriage for printing spreadsheets and reports. A switch on the front panel enables "quiet printing" (less than 51 decibels) for office settings.

A built-in interface for IBM Proprinter™ XL24 emulation provides full compatibility with Digital and IBM Proprinter applications for Digital's DECstation personal computers and workstations and VAXstation workstations, plus IBM and IBM-compatible PCs and servers.



Increasing Microsystem Performance

MicroVAX II and VAXstation II computer owners can get 4.5 times more performance from their systems cost-effectively with a simple incabinet upgrade.

Users can choose between the KA650 CPU module (in MicroVAX 3500 and 3600 systems) or the KA655 CPU module (in MicroVAX 3800 and 3900 systems). The upgrade package includes a MS650 memory board, and a VMS, ULTRIX, or VAXELN license.

MicroVAX and VAXstation systems housed in a BA23, BA123 or H9642 chassis can upgrade to the improved board design. However, some Q-bus I/O modules modules may require revision to complete the upgrade. In some cases, a system upgrade and the H9642-S expansion cabinet to house the MicroVAX II peripherals can be the best solution.

The upgrade kits are available on an individual quote basis. Provide MicroVAX II system configurations (module numbers) to your local sales representative or call Digital sales support at (800) 832-6277.

Realtime Systems Stride Along with Processor Advances

Since the introduction of the PDP-11 system almost twenty years ago, Digital has been committed to providing realtime solutions for a wide array of applications. This tradition continues with the introduction of the rtVAXstation 3100 Model 30 and Model 38 and the rtVAX 3305 systems. In addition, a new BA212 enclosure for rtVAX 3400 and 3800 systems can be rackmounted in a smaller space.

Each of these diskless realtime systems can perform demanding tasks in a variety of environments such as manufacturing plants, flight simulation labs, utility control rooms, and laboratories. Tasks include automating data acquisition, simulation, process control, and utility management. Regardless of the application, these new realtime systems excel where price and performance are important.

Accelerating Along with Technology

The rtVAXstation 3100 Model 30 and Model 38 systems combine the standalone performance of a VAXstation workstation with realtime software for sophisticated computing requirements. Either workstation provides a powerful yet inexpensive system that combines a VAXELN-based realtime system with DECwindows graphics and windowing software. A VAXELN Target license is included with all rtVAX configurations.

The rtVAXstation 3100 Model 30 system performs at 2.8 VUP,[1] the same as the MicroVAX 3500 and 3600 systems. The rtVAXstation 3100 Model 38 system computes at a rate of 3.8 VUP, the same as the MicroVAX 3800 and 3900 systems. In addition, these are diskless systems with 8 Mbytes of memory that is expandable to 32 Mbytes.

Each system can be ordered with either a 16-inch or 19-inch monitor and includes a keyboard and a mouse for easy interaction with the DECwindows interface. Small enough to sit on a tabletop, the rtVAXstation 3100 Model 30 and Model 38 systems are appropriate in environments that require the windowing capability of the VAXstation monitor with a very small footprint.

A System That Is Right on Target

The rtVAX 3305 diskless VAXELN target system makes an excellent distributed computing platform, especially for process control, factory data collection, and machine automation. Consisting of the KA640-BA processor in a BA214 rackmount or wallmount enclosure, this system performs at 2.4 VUP with 4 Mbytes of memory (expandable to 52 Mbytes). Five Q-bus slots are available for Q-bus options designed specifically for realtime applications.

Choosing the right realtime system means looking at all the variables – size, speed, price, and ability to get the job done. Digital's complete family of rtVAX dedicated realtime systems offers a range of systems and options from which to choose.

Three Realtime Systems at a Glance

	rtVAXstation 3100 Model 30	rtVAXstation 3100 Model 38	rtVAX 3305
Performance (VUP)	2.8	3.8	2.4
Enclosure	Desktop	Desktop	BA214
Maximum Memory (Mbytes)	32	32	52

[1]VAX Units of Performance (1 = VAX 11/780)

Controlling IEEE Instruments from the Desktop

The VAXlab Software Library (VSL) and the IEZ11 Bus Converter enables a workstation user to control IEEE488 instruments in test and measurement applications.

Detailed work in laboratories and manufacturing departments for test and measurement applications often requires computer-controlled instruments. These devices usually work well together, thanks to the incorporation of IEEE488 standards.

VAXstation 3100 and MicroVAX 3100 systems can now control all IEEE488-compliant equipment. The systems use an IEZ11 SCSI/IEEE488 Bus Converter to connect to the instruments. The VAXlab Software Library (VSL) V1.4 manipulates instruments from a high-level language such as FORTRAN or C.

The IEZ11 connector links to both the SCSI port on the Digital system and to the IEEE488 bus. Each IEZ11 can connect up to 14 devices; two IEZ11s can connect to a VAXstation 3100 or MicroVAX 3100 system. Maximum throughput is 500 Kbytes per second. The IEZ11 meets SCSI-2 (ANSI X3T9.2) and IEEE488-1978 standards.

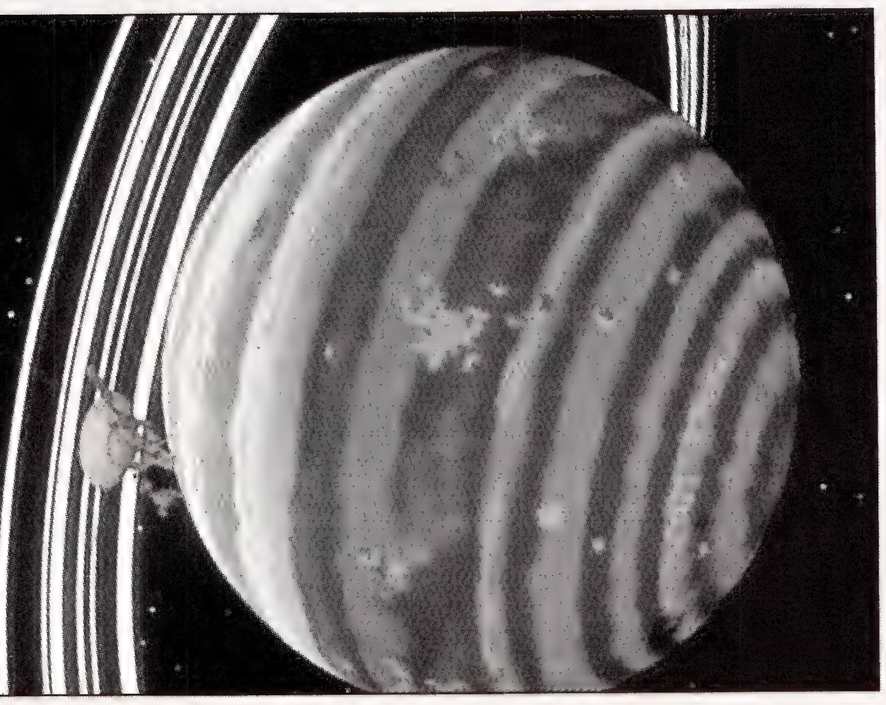
VSL performs all SCSI interactions transparently to users. The application handles other realtime tasks – such as buffer management, memory locking, and priority management – from the VMS operating system, freeing the user to concentrate on control of the device.

As part of its library, VSL includes a common mathematical, statistical, signal processing, and laboratory graphics functions. A user can collect data from instruments, process it, and display it as a two-dimensional or a three-dimensional graph. With DECwindows software, the user can incorporate the graph as part of a DECwrite document.

Digital's integrated solution provides a low-cost, high-performance solution for instrument control applications.

Customer Services Aids Voyager Mission

While the Voyager 2 spacecraft was sending pictures of the planet Neptune from up above, Digital specialists were working down below to ensure that the VAXcluster system receiving the transmissions at NASA's Jet Propulsion Laboratory (JPL) functioned smoothly throughout the mission.



Digital's Customer Services' Los Angeles Metro district maintained operation of JPL's configuration during the critical period in August when Voyager 2 transmitted photographs of Neptune back to Earth. Located in Pasadena, California, the JPL's VAXcluster system is composed of two VAX 8650 computers and two VAX-11/780 machines.

A third-party service maintained the JPL's VAXcluster system until a problem developed in March that could not be resolved. Digital Customer Services personnel fixed that problem, and in June, the JPL signed a contract with Digital to maintain its entire computer lab through the Voyager 2 mission. Customer Services formed a team that determined what work needed to be done to bring the JPL VAXcluster system up-to-date and ensure system reliability. Upgrades and major maintenance tasks were performed throughout the month of June.

During the transmission of pictures in August, a Digital customer services engineer and back-up personnel were available around the clock in case any system problems developed. No problems occurred, but a final system check scheduled for the first day of the mission brought some tense moments.

"We had scheduled downtime with the customer for a final check," District Manager Aggie Rucker explained. "When the engineer arrived onsite, he encountered the increased security measures that came with the arrival of Vice President Dan Quayle. With great persistence, our engineer was able to gain access and complete his assignment on time. He finished at 12:05 P.M. – and the first pictures came through at 12:07 P.M.!"

Digital Earning Top Ratings as Employer

Digital was cited recently by two publications for positively responding to the needs of its employees.

For the fourth time, Digital was named on of the 60 best employers for working mothers by *Working Mother* magazine. The magazine has included Digital on its list every year since establishing its survey of American companies' policies towards working mothers four years ago.

In its annual survey, *Working Mother* rates each company on salaries, opportunities for advancement, and support for child care and benefits. Digital offers flexible work hours, part-time and job sharing positions, up to $1,500 in adoption aid, and eight weeks of paid maternity leave and eight weeks of unpaid parental leave.

Manufacturing Engineering magazine selected Digital as one of 10 winners of its 1989 Manufacturing Excellence award.

This year's award focused on companies that are deemed "a good place to work." Candidates were judged on criteria such as quality of supervision or leadership, stability, and continuing learning opportunities.

Of Digital, the magazine writes: "A company trust in employees, an open corporate culture, and an energetic, future-oriented work environment make Digital...a great place to work. The company is characterized by openness and sensitivity..."

Jump Recorded in DECtp Installations

DECtp transaction processing installations grew 50 percent during the last fiscal year, according to a recent Gartner Group Software Management Strategies Report.

The report said that Digital earned a 5.5 percent share of the $35 billion transaction processing market during fiscal year '89. Digital has installed more than 2,000 DECtp monitor-based systems.

In response to the interest, Digital has opened DECtp customer resource centers in New York, Chicago, Atlanta, and Los Angeles. Staffed by highly trained specialists dedicated to supporting the growing DECtp customer base, the centers are part of a network of transaction processing operations.

Digital Storage Group Earns CIM Award

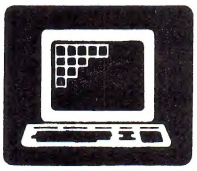
Digital's Storage and Information Management Group has been selected as one of two winners of the 1989 LEAD award presented by the Computer and Automated Systems Association of the Society of Manufacturing Engineers (CASA/SME) for its development work on the RA90 disk drive. The LEAD award – "Leadership and Excellence in the Application and Development of CIM" – is the highest recognition in the computer-integrated manufacturing (CIM) field given to professional teams from industry and academia.

University Lab Adds DECstation 3100s

The computer laboratory at Cambridge University in the United Kingdom is purchasing 50 DECstation 3100 workstations and three DECsystem 5400 file servers as part of the university's recent expansion of its computer science curriculum from a two-year offering to a full three-year program.

Purchased primarily for teaching purposes, the new equipment enhances the university's existing computer environment, which includes Digital's MicroVAX and VAX systems as well as systems from other vendors. The computers already installed are used for both teaching and research purposes.

To purchase or learn more about products featured in Product INSIGHT, *or to read back issues of the magazine, use the online Electronic Store. All you need is a VT100-compatible terminal and a 1200-baud modem. Then just dial 1-800-234-1998 from any location in the United States. For more information about Digital products and services, please call your local Digital representative or the Corporate Customer Assistance line, 1-800-DEC-INFO (1-800-332-4636).*



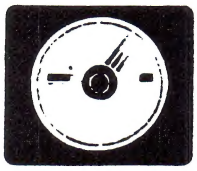
Hardware

Microsystem Peripheral Processor Yields Additional VAX System Support

The KXJ11 peripheral processor can act as a coprocessor, a realtime processor, or an I/O processor. When running as a coprocessor, it offers J-11 power with floating-point capability and 512 Kbytes of working-space memory.

VAX CoProcessor/RSX software and the KXJ11 processor now support MicroVAX 3500 and 3600 systems and the VAXstation 3200 and 3500 systems. The KXJ11 processor and VAX CoProcessor/RSX software allow for the gradual migration of RSX applications to VMS native code.

Correction:
The chart on page 15 of the October issue contained incorrect data on the MicroVAX 3400 system. The computer's five-year cash outlay divided by its transactions per second should have been listed as $41K/TPS. This figure indicates that the MicroVAX 3400 system is much more cost-effective than computers with comparable performance, such as the IBM AS/400 Model B45 ($58K/TPS) and the IBM AS/400 Model B35 ($65K/TPS).

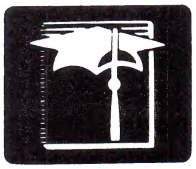


Software

DECwrite V1.0 Lexicons Can Correct Documents in Seven Languages

DECwrite V1.0 now has lexicons to check spelling in American English, British English, French, German, Dutch, Swedish, and Spanish. Prepared by linguistic experts in each language, these comprehensive dictionaries are based on the most frequently used words in each language. The American English and British English lexicons each contain more than 87,000 entries based on the American Heritage Dictionary.

In addition, two optional American English lexicons are available – one for the legal, banking, and financial markets, which contains an additional 8,000 words; the other for the medical and pharmaceutical markets, which contains an additional 70,000 words.



Education

ULTRIX, DECwindows, and VAX Tools Dominate Latest Course Offerings

"Using the ULTRIX User Executive and DECwindows Desktop Applications" provides ULTRIX DECwindows software users with the knowledge and skills needed to effectively use the ULTRIX User Executive graphics interface to the ULTRIX operating system and applications bundled with DECwindows software. This computer-based instruction (CBI) course includes descriptions, demonstrations, and practice with actual applications.

The VAX CDD/Plus data repository is central to application development for a wide range of Digital software products. "Using VAX CDD/Plus" describes concepts and offers practice in creating, populating, and maintaining VAX CDD/Plus data dictionaries. This text-based course features instruction on creating and designing dictionaries and dictionary directories, defining and maintaining data and record entities, and specifying protection for dictionary objects.

Campus Library and Information Systems Examined in New Digital Press Book

Campus Strategies for Libraries and Electronic Information (order number EY-C185E-DP) offers guidance and models of libraries for computing decision-makers. Developed by EDUCOM and supported through grants from Digital and other major computer manufacturers, the book highlights the handling of information in electronic form through case studies of actual implementations. It also includes information about recent technology trends, prospects for the future, and the work of the Online Computer Library Center and Research Libraries Group bibliographic utilities.

Videotape Details Network Security, With Focus on VMS Operating System

"Viruses, Worms, and Trojan Horses: Security in Networked Computer Environments" features six Digital network security experts discussing network computing security issues. Topics include security threats; preventing security problems, employing countermeasures such as using physical and logical controls, limiting access and privileges, and performing audits to track and apprehend intruders; establishing and implementing corporate-wide and site security awareness and policy, and using the VMS security features.

Digital's Complementary Solutions Organizations (CSOs) extend the portfolio of solutions available to the company's diverse customers. Leading application suppliers team up with Digital through the Cooperative Marketing Program, joint marketing and joint product development agreements, and system reseller agreements. Digital and its CSOs bring a wide range of integrated computing solutions to the marketplace.

Fisher's CHIP Joins Control Systems With Process Information Collectors

Fisher Controls International's Computer/Highway Interconnect Package (CHIP) provides a high-speed connection between PROVOX® and VAX systems. The control system can share captured information with VAX application programs. CHIP includes a hardware interface, communications software, and a memory-resident realtime database. The software is a set of programs that permits data transfer directly between applications and a PROVOX system.

PROVOX components include PROVUE,® PROFLEX,® and a family of microprocessor-based controllers that precisely administer for continuous and batch processes. PROVUE, an rtVAX-based console, allows the process operator to monitor and control the processes. PROFLEX, a VAX system-based workstation, enables the control engineer to configure, debug, and diagnose the PROVOX control system. PROFLEX can run either on a MicroVAX 2000 processor or the CHIP host VAX system.

Software Tools Develop High-volume Production Control Applications

Setpoint, Inc., a Digital CMP, provides SETCIM and GCS products. This agreement expands a previous CMP relationship based on SETCON, an area-control-level product used primarily for advanced controls and data collection in the process industries. Also designed for the area-control level, SETCIM tools are used to develop and operate a system primarily for high-speed, high-volume production and material handling operations. These tools include database formation with named data points and graphics. A realtime spreadsheet and a statistical quality control package are available as options.

SETCIM, an open system, allows storage of reports and data records in ASCII files for sharing with other applications over the network. A complete library of database-access subroutines supports user-written programs. With GCS, a common graphics editor/console for SETCIM and SETCON on MS-DOS*-compatible and VMS workstation systems, the user has a single console for displays that may combine information from either or both types of systems, even on the same screen.

*MS-DOS is a registered trademark of Microsoft Corporation.

StrataCom Agreement Integrates IPX Nodes and DECrouter for T1 Networks

Digital and StrataCom, Inc., announced a joint development agreement for enhanced interfaces between OSI-compliant DECrouter products and StrataCom's IPX™ nodal processors for T1 enterprise backbone networks. These processors are used primarily in large manufacturing installations, financial institutions, retail and health service organizations, and information services companies. Functional integration of DECrouter capabilities and IPX nodal processors provides superior OSI network performance.

Digital will jointly deliver onsite service and support for StrataCom's family of FastPacket™ T1 Bandwidth Management Systems in Digital customer accounts. FastPacket Systems allow integration of voice, data, video, and image networks over T1 high-speed facilities, providing highly reliable private network applications.

DISC ACCESS Banking Application Helps Corporate Customers Cash In

Digital and DISC, Inc., have signed a CMP agreement for DISC ACCESS, an online, realtime cash management system that provides an "electronic window" for the bank's corporate customer. The application enables the customer to access time-sensitive financial data directly. Primary features include balance reporting, deposit reporting, cash concentration, money transfer, and stop-payment initiation.

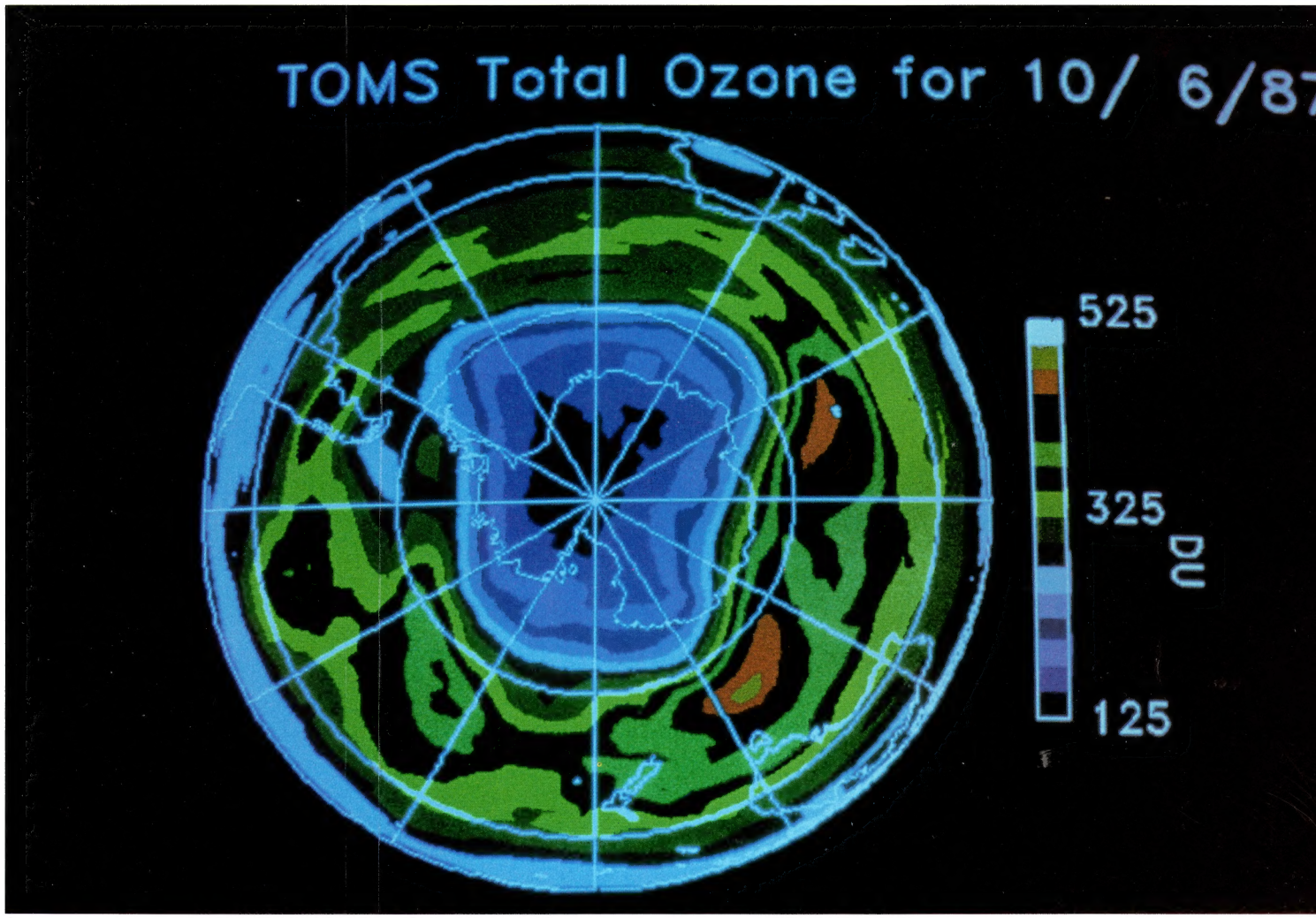
With an inhouse product such as DISC ACCESS, banks can offer cash management services to their corporate customers as proprietary products. Both the bank and the bank's customer benefit through reduced operating expenses and enhanced customer service.

With WorkStream, Manufacturers Track Production Functions at Plant Level

Consilium Associates, a Digital CMP, has renamed its COMETS™ shop-floor management application to WorkStream. Manufacturers with lot-based and discrete batch production environments use the software to track key resources such as material, equipment, personnel, specifications, and facilities at the plant level. WorkStream also provides functions for costing, analysis, and reporting from collected factory data.

Computer-aided Mapping Application Charts Course for Data Storage

Digital and Environmental Systems Research Institute (ESRI) have signed a CMP agreement for ESRI's ARC/INFO™ mapping application. A vector-based graphic information system, ARC/INFO is based on a dual approach: The ARC™ system is used for storing cartographic data, and the INFO system is a fully relational database. Key strengths of ARC/INFO are its flexibility and its ability to be customized.



A graduate student at the University of Bern removes an ice-core sample for analysis. The next episode of The Infinite Voyage features the study of ice cores to determine changes in global temperatures. The show airs November 29 on the Public Broadcast Service and the week of December 4 on commercial stations.

Digital believes the information in this publication is accurate as of its publication date. Such information is subject to change without notice. Digital is not responsible for inadvertent errors.

In order to best meet local market needs, certain products may not be available in all locations. Conditions for products and services may vary from country to country.

For further details, contact your Digital sales representative.

The following are trademarks of Digital Equipment Corporation:

ALL-IN-1, CDA, DEC, DECdecision, DECextender, DEC LANcontroller, DECnet, DECstation, DECsystem, DECwindows, DECwrite, HSC, LiveLink, MASSBUS, MicroVAX, MicroVAX II, MicroVAX 3100, MicroVAX 3500, MicroVAX 3600, MicroVAX 3800, MicroVAX 3900, PDP, RSTS/E, ULTRIX, UNIBUS, RSX, RT, rtVAX, VAX, VAX-11/780, VAX 6000, VAX 9000, VAX ACMS, VAXBI, VAX CDD/Plus, VAXcluster, VAX LSE, VAX Notes, VAXpc, VAX Rdb/VMS, VAXserver, VAXstation, VAXstation II, VAXstation 3100, VAXstation 3520, VAXstation 3540, VAX VTX, VMS, VT, WPS-PLUS, and the DIGITAL Logo.

digital™

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 33 MAYNARD, MA

POSTAGE WILL BE PAID BY ADDRESSEE

Digital Equipment Corporation
PRODUCT INSIGHT Circulation Dept. MK01/W83
Continental Boulevard
P.O. Box 430
Merrimack, NH 03054-9931

digital

Digital Equipment Corporation
PRODUCT INSIGHT Circulation Dept. MKO1/W83
Continental Boulevard
Merrimack, NH 03054-9931

BULK RATE
U.S. POSTAGE
PAID
DIGITAL
EQUIPMENT
CORPORATION

S300K02-CC:2JN MA
M 37A 100 ZK02-3/N30
ARON K INSINGA
DIGITAL EQUIPMENT CORPORATION
110 SPIT BROOK RD
NASHUA NH 03062-2642

PRODUCT INSIGHT

November 1989

Please send me more information on:
A. ☐ ALL-IN-1
B. ☐ Multivendor networking
C. ☐ Realtime
D. ☐ VAX 9000
E. ☐ VAX leasing
F. ☐ VAXstation 3100
G. ☐ Wide-area networking

I am a current Digital customer.
☐ yes ☐ no

I work with computers as a (check one that best applies):
☐ Management User
☐ Administrative User
☐ Developer/Programmer
☐ Technical Recommender
☐ Evaluator/Approver
☐ Consultant
☐ Other _____

☐ Please add my name to the *Product INSIGHT* mailing list.
☐ I've made corrections here.

☐ Please continue sending *Product INSIGHT*
☐ yes ☐ no

Name _____

Title _____

Company _____

Address _____

City, State, Zip _____

Telephone #( ) _____

EC-P0146-32